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Current Science

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MUSEUMS OF THE UNITED STATES OF AMERICA

IT has often been said that one standard by which the prosperity of a country can be judged, is the number and quality of its museums. The United States of America is by this standard, easily in the forefront of prosperous nations, for her museums are ahead of those of any country the writer has visited in exhibition, exposition and research. They are today dynamic educational institutions. Their role is to raise the level of life of the average man by increasing his knowledge and placing within his reach opportunities for creative work. They stimulate the young minds of the children, yoke their exuberant energies to profitable pursuits and provide them with interests other than those provided in schools which help them subsequently to make contributions of outstanding value in the fields of Science, History or Art.

Generally speaking, the museums of the States could be broadly classed into ten groups—Science Museums, Museums of Science and Industry, Art Museums, History Museums, Historical Site Museums, Planetaria, Trailside Museums, Travelling Museums, Park Museums and Children's Museums. The American Museum of Natural History in New York and the Museum of Natural History in Chicago, up till lately known as the Field Museum of Natural History, are famous examples of Science Museums in the U.S.A. The former is accepted to be the largest and finest in the world. The Buffalo Museum of Science in New York State, though small compared with the two just mentioned, is a fine example of a typical Science Museum. These institutions are devoted to the illustration of the sciences of Zoology, Botany, Geology and Anthropology. Astronomy is also a favourite subject in most Science Museums. The American Museum of Natural History has the Hayden planetarium attached to it which is devoted to Astronomy. In Chicago,

the Adler Planetarium fulfils this function, but it is a separate institution from the Museum of Natural History. The Buffalo Museum has a small Observatory with an eight-inch refracting telescope on the roof of the building. Most Science museums, like the Cleveland Museum of Natural History and the Cranbrook Institute of Science have strong Astronomy sections in their exhibition Halls. The Buffalo Museum of Science in addition, has sections in Physics and Chemistry, Meteorology, Numismatics and Art. A small aquarium and a vivarium are also a feature of many Natural History Museums. The American Museum of Natural History has a section devoted to live insects.

Museums of Science and Industry on the other hand, are devoted to subjects like Physics, Chemistry, Power, Fuels, Metals, Medicine, Agriculture and Transportation. The museums of Science and Industry in Chicago and New York and the Franklin Institute of Philadelphia are among the chief institutions of this type. These museums are said to have been inspired by the great Deutches Museum in Munich which is recognised to be the first museum in the world to present exhibits of this kind. In the Museum of Science and Industry in Chicago, the writer saw an operating coal mine, complete in every detail, a model of an electric railroad, 3000 ft. long, illustrating all the operating problems of a modern transport system ; a print shop, iron foundry and industrial processes like oil refinery, phases of automobile manufacture, etc. In the New York Museum of Science and Industry housed in the R. C. A. building in Rockfeller Centre, subjects such as Transportation, Electrotechnology, Communications and Power Transmission are illustrated among other things.

Then there are the Art and History Museums, and in addition, what are called Historic site museums or out-of-door museums in History. Many old buildings of great interest, sites famous in history, thus function now as museums, inviting the attention of the public to the significance of these places. The Fort Niagara Museum in New York State and the Ursuline Monastery of Quebec in Canada are examples of this type of museum which the writer had occasion to visit. Similar museums in the field of Natural History are called Trailside Museums. The Bear Mountain Trailside Museum, the Trailside museums of the Cleveland Museum of Natural History and the Trailside Museum in the Redwoods Park, California, are examples. In these instances, a woodland trail is maintained along which trees, shrubs and herbs, rocks and other natural objects are labelled. Apart from these trails, there are actual museums located in the National Parks which are devoted solely to the illustration of the Natural History of the Parks.

Travelling Museums are another type which are coming more and more into prominence today in the U.S.A. These museums are installed in trailer units attached to automobiles. The one the writer saw belonged to the Children's Museum in Washington D.C. The trailer contained exhibits arranged on shelves, of scenes from India, China and Poland, minature models of various national types and books and pamphlets describing them. It was touring the country stopping in market-places and public parks to show their exhibits. The writer saw a similar one belonging to the Cleveland Museum of Natural History. It carried exhibits illustrating the migration of birds, the storage of food and hibernation on the part of mammals, and such phenomena as the scattering of seeds and the shedding of leaves by trees and other kindred subjects.

The planetarium is a very interesting institution devoted to Astronomy. The first of its kind to be established in the U.S.A. is the Adler Planetarium of Chicago, founded in 1930. Other famous planetaria are the Hayden Planetarium in New York mentioned above, the Buhl Planetarium in Pittsburgh, the Fels Planetarium in Philadelphia and the Griffith Observatory and Planetarium in Los Angeles. The Planetarium chamber is circular in shape and has a hemispherical ceiling. On the floor, towards the centre is located the planetarium instrument and seating facilities for the audience. With the help of the instrument, the demonstrator projects the sun, moon, planets and stars on the ceiling of the darkened chamber, so that the spectators get a clear view of the various aspects of the heavens, at any period in the past, present or future.

Finally, there are the Children's Museums devoted exclusively to subjects of interest to children. They are quite large in number and are distributed throughout the country. Then there are a few museums such as the museum of the American Numismatic Society, New York, The National Academy of

Design, New York, The Cleveland Museum of Health, The Mariners' Museum in Hampton Roads and the National Baseball Museum in Cooperstown, New York, which although devoted to special subjects are in reality the elaboration of any one of the topics covered by museums of Science, History or Art.

Whatever be their field, the exhibition programmes of museums today in the States is designed to educate the public. Education is their primay function. This marks a definite phase in the evolution of museums. In the first stage, they were a store-house of curiosities, assembled together by men of means and leisure, but with no definite purpose in view. Later, when the collections grew in size and importance, they became the subject of study, identification and classification. Many of the specimens of no particular interest were discarded, the museums lost their nature of 'old curiosity shops' and the collections came to be displayed, all of them, in neat, orderly series. Most museums of the world, including ours in India, with the exception of the Prince of Wales Museum in Bombay, are in the second stage of development. In the United States of America, they have gone a step further. They have removed most of their collections into storage rooms exhibiting only those of a more educational nature and of more popular appeal. The guiding principle in their exhibition methods is the use of specimens only in so far as they serve to illustrate an idea and not exhibit them, merely for the sake of exhibition. Thus the American museums could be described as museums of ideas whereas our museums are essentially museums of objects.

In planning museums, the types of visitors who are likely to visit the museum in greater numbers is taken into account and the exhibition programme modified to meet their needs. Invariably, they are designed from the point of view of the common man with no previous knowledge in the subject. Due consideration is also given to the needs of the child visitor, for whose sake exhibits are placed low enough. Even labels are so prepared that the child can easily read and undestand them. For the more advanced visitor, the collections in storage are organised into neat, orderly, easily accessible series. Visitor comfort and visitor reaction are subjects of study by museum planners, who make use of the results in making fresh installations or altering the existing exhibits. Restful seats here and there in the galleries, to relieve the protesting feet of visitors are a common feature of every museum today.

An uderlying principle discernible in the selection of topics for illustration in Science museums is that they should, through their exhibit programme, give the average visitor some idea of himself and his environment. This would involve a detailed knowledge of his country in relation to the world ; some idea of it in space and time and its niche in the world's economy ; facts relating to its mineral, agricultural and human resources ; its fauna, flora and geology, against a background of the animal and plant life of the world, past and present ; the life and culture of the primitive peoples ; the contributions of the various social groups to general culture and progress, also the story of the development of civilization and finally the common problem of everyday science with a section on health and how to take care of it. Any other scheme by which indispensable information of this type could be given to the masses is possible, provided the museum knows how to present them. Having chosen the topics, they are illustrated as attractively as possible, bestowing attention to such factors as the treatment of walls, lighting, size and shape of showcases and format and placement of labels. The dictum "more art in Science museums and more science in Art museums" is nowhere truer today than in the museums of the U.S.A.

These installations are of a permanent nature. However attractive they are, after a time they become static and dull. People feel that there is nothing more to see in the museum. To prevent this, temporary exhibits of topical interest are held in most museums. At the time of the writer's visit to the Buffalo Museum, there was on show for a short period, an exhibition of jokes at the expense of museums. This consisted of an extraordinary collection of cartoons and caricatures featuring museums and their activities and proved a tremendous success. At the American Museum of Natural History two such exhibitions were in progress at the time the writer was there ; one related to Atomic Energy and the other, entitled "From the Neck up" was a very interesting and stimulating display of the head adornments of the various peoples of the world. Temporary exhibitions of this kind go very far in removing the dullness that accompanies permanent installations.

Whether the exhibition be temporary or

permanent, the resources of modern technology and skilled craftsmanship are available to make it attractive. Large halls are usually broken up into alcoves and a colour scheme harmonious with the specimens and showcases is adopted for the treatment of walls and ceiling. Murals, closely related to the topics illustrated are used wherever possible. It is a common practice to light individual cases with fluorescent lamps, leaving the exhibition halls comparatively dark. Labels are also prepared in keeping with the attractiveness of the general layout. A tendency to have them handwritten in preference to typed or printed is noticeable in several museums. Monotony and dullness are recognised as the two major enemies of attractive display and every effort is made to overcome them.

The dominating attraction of all Science museums and most Historical museums today, however, is the Diorama or Habitat group, It has reached a very high standard of excellence in the American Museum of Natural History, New York, the Natural History Museum, Chicago, the Academy of Sciences, Philadelphia, in the San Francisco Museum and the Denver Natural History Museum. The Bison group and the Bear group in the Buffalo Museum of Science are excellent. The degree of realism attained in these types of display is wonderful. In some instances, to add to the realism, running water, gusts of wind and even the aroma of field and forest at the particular season in which the show is laid, are introduced! The modern diorama is a marvel of creation and involves the combined skill and life-time experience of artists, photographers, plant modellers, animal sculptors, tanners, electricians, cabinet makers, smiths and other technicians. The cost of such a habitat group naturally runs into several thousand dollars.

In some museums, where cost is a great consideration dioramas have been made in miniature with as good results. They are so accurately done to scale, that the onlooker fails to realise that the scene he is watching is a miniature reproduction. The African Waterhole group in the Buffalo Museum of Science comes to the writer's mind in this connectoin. The same group is exhibited in life proportions in the African Hall of the Academ of Sciences, California, and the African Hall of the American Museum of Natural History. He feels that what they have achieved at enormous cost is not very much greater than what the Buffalo Museum has achieved with its miniature reproduction of the same group at a fraction of the cost.

Just as everyday objects sometimes look very attractive in miniature, in some cases, they have a fascinating interest if enlarged several times to outsize proportions. Thus the familiar models of the house fly and bed bug in some of our museums, are enlarged not only for the sake of magnifying its small body parts to aid our vision, but to make for attractiveness also. In the Cleveland Museum of Health are exhibited outsize models of the human Ear and Mouth which seldom fail to draw admirers. The discrete use of miniatures and outsize models, of mirrors in producing an illusion of depth, where it is not possible otherwise, illustration of objects in the flat by cut-outs from suitable material are some of the methods which museums employ to make their displays interesting.

There is yet another device in use on an extended scale in most museums—the introduction of mechanical exhibits which could be operated by the visitor. In the Rochester Museum of Arts and Sciences, the exhibits illustrating the manufacture of glass is to be operated by the visitor. When he pushes a button, the concealed mechanism starts to life and the whole series of processes in the manufacture of glass pass in their sequence, before his eyes. In the Buffalo Museum, the actual rattling of a rattlesnake is made audible to the visitor by the mere pressing of a switch. In another case, illustrating the life of a cave, the visitor has to "on" the switch before the bats, salamanders, newts and other animals exhibited in the darkened cave, will become visible, one after another.

Unlike our museums, the exhibits of almost every American museum are supplemented by a well organised educational programme, by which it offers educational facilities to the people, young and old. The following list of the educational activities of the Buffalo Museum is typical and would serve to show the extent and possibilities of this aspect of museum work.

A. *For Children.*—

1. Conducted tours for school children within the museum during school hours.
2. Saturday morning story hour for six year olds.
3. Saturday morning Nature Sketch classes.
4. Saturday afternoon courses for older children in simple Astronomy, Birds, Trees, Reptiles, Minerals, Geology, etc.
5. Field trips—Nature Hobby clubs.

6. Saturday afternoon Craft clubs—when children who show interest are taught crafts like wax or clay modelling, plasticine work, leaf printing, casting in plaster, soap carving, etc.
7. Saturday afternoon Music appreciation classes.
8. Eurythmics.
9. Lending teaching aids to schools such as Exhibits, Lantern slides, Microscopical slides, Music records and Scores, Nationality dolls, Maps, Flags, Pictures and finally, Sound and silent films on educational topics.

B. *For Adults.*—

1. Regular courses in a number of practical subjects such as Sketching, Photography, Shell craft, etc., organised by the staff and held in the museum during evenings.
2. Promotion of Clubs like the Conchological, Microscopical, Botanical, Bryological, Horticultural, Astronomical, Geological, Photographic, Archæological, Ornithological and other scientific groups.
4. Lectures on Science, Exploration and Travel by eminent men and women.
5. Popular Science lectures by local scientists.
6. Travel talks.
7. Courses in Field Biology in Summer Camps.
8. Library facilities.
9. Travel Information Bureau.
10. Garden Information Bureau.
11. Identification service—of specimens brought in by visitors.

The museum is an agency not only for the diffusion of knowledge but for its accumulation also, in virtue of the large collections of cultural value that it has in its vaults. The majority of American museums have extensive research programmes based on their collections. All the larger museums send out scientific expeditions every year to the remotest corners of the globe and the collections brought back are worked out by the museums' scientific staff and published as memoirs and bulletins. Researches are also sometimes carried out on such subjects as the effectiveness of displays, visitor comfort, etc., like the studies made by Professor Robinson of the Department of Psychology of the Yale University "to test, develop and improve techniques of serving groups of school children visiting the museum under guidance".

In order to hold educational lectures, concerts and entertainments, almost every museum has a fair sized auditorium. Some museums have a series of smaller lecture halls in addition. The auditorium is usually fitted with a stage, large enough to accommodate a full size symphony orchestra and is air-conditioned and acoustically corrected.

It seems hardly necessary to indicate that all these activities such as scientific expeditions, modern installations and educational programmes involve very heavy expenditure. Almost all the museums of the U.S.A. are supported both by the Government and the people. At the back of every museum there is an organisation which receives donations of various kinds from the public to finance its activities. Some museums are entirely supported by these organisations. The total membership of the American Museum of Natural History at the end of June 1947 was 34,398.

The museums of India present a very different spectacle. They are far behind the American Museums in exhibition, education and research. The only exception is the Natural History Section of the Prince of Wales Museum in Bombay, where the exhibition methods are on a par with those in America. They are well balanced by an active Research programme. The writer was gratified to hear in New York the name of its Research Journal, the *Journal of the Bombay Natural History Society* mentioned as the best of its kind in the world. Even this museum does not have any educational programme for childern or for adults. The museum is an agency with tremendous possibilities in educating the masses. There are nearly 2,000 museums in America to serve its population of 130,000,000. This works out to one museum for every 65,000 people. We in India, with a population of nearly 400,000,000 people (before partition) have only 100 museums or roughly one museum for every four million people. We should have at least 6,000 museums to reach this ratio.

So far as India is concerned, her contribution to the development of museums has not been appreciable. This is due to a variety of reasons, the foremost of which is that the museum is something exotic—a legacy which has been left her by the impact of Western Civilization. Not having flowered out of her own genius and not directly tied to the inte-

rests of the common man, she has not had much room for improvement. The word "museum" itself is derived from a Greek word meaning the abode of the Muses, or the Goddesses of Learning and the first museum in the world in Alexandria was founded in the 3rd century B.C. by the Macedonian General Ptolemey Soter, who became a Pharaoh. It was a real temple of knowledge where learned men from far and near came, studied and discussed various problems. Sculptures in stone, wood and metal paintings and even Natural History specimens were among the objects exhibited here. But this great museum died a natural death in the course of the next two centuries, mainly because its influence did not go below the level of the wealthy and influential class to the common man. Nearly 1,800 years were to elapse before the next museum was established in Germany by Conrad Gesner in 1598. His museum exhibited a large number of Natural History specimens and is considered to be the forerunner of the modern museum.

The second reason why the museum has not taken kindly to the Indian soil is due to a mistaken notion about the function of the museum. There is a fallacious belief, even among the intelligentsia of our country that the sole aim of a museum is recreation and not education. The primary function of a museum is education and the spreading of culture. Recreation is only incidental, although it is an element of great importance. Recreation is only a means to an end, where the end is education. Because of this attitude towards museums as purely recreational institutions, financial help from governments have always been meagre.

No museum that depends entirely on government for its support can make much headway with the limited funds allocated to them. Museums can never prosper, as exemplified by the great Alexandrian museum, if they do not fill a popular want and enjoy popular support. Unless the financial support of museums comes from the generous help of governments on the one hand and people on the other, there is no reasonable chance for them to prosper. The main reason for the stagnation of our museums is the niggardly support they get from governments.

1. The first step to take to improve our museums is to recognise the fact that museums have tremendous possibilities as agencies for educating the people. With this recognition, marked improvement in every direction is sure to result.

2. The present system of exhibition should be replaced by modern installations. The bulk of the collections should be put in reserve for the use of the serious student. A scheme for the teaching of a few worthwhile topics .to the people should be prepared. Only those specimens from the reserve collections which are needed for the purpose be exhibited. The form of presentation should be simple, direct and dramatic to arrest the attention and hold the interest of the onlooker.

3. There should be temporary exhibitions of topical interest in a hall or halls specially provided for the purpose.

4. To supplement this exhibition programme there should be educational activities suited to the needs of our people young and old.

5. Museums should be more evenly distributed in India. There should be a National Museum in New Delhi and a Provincial Museum in every Province. Each Provincial Museum should have several branch museums, one for each town with more than five schools. There should not be more than one museum in any localilty, as they are apt to breed competition and the people are likely to pay only divided attention depending on the power exerted by any one museum. One of these branch museums should be a trail-side museum consisting of a few acres of undisturbed forest land, to serve as a field station for the study of Wild Life.

6. The National Museum in New Delhi should have the following themes illustrated in its exhibition halls :—

(1) India in space—its position in relation to the world, the world to the solar system and the solar system to other systems.

(2) Our India : Illustration of its animal, plant, mineral and human resources—on the lines of Masani's "Our India".

(3) The Natural History of Delhi Province—Habitat groups.

(4) The Natural History of India—Habitat groups.

(5) Glimpses of the Animal life of the world.

(6) Glimpses of the Plant life of the world.

(7) Introduction to the Geology of the Earth.

(8) India in time: On the lines of the Discovery of India.

(9) World in time: On the lines of the *History of the World* by H. G. Wells.

(10) Art of Delhi Province—Art of India.

(11) Glimpses of World Art.

(12) Primitive Races of India and their Culture.

(13) Cultures of the different peoples of the world.

(14) The chief Industries of India including Agriculture.

(15) An introduction to everyday science.

(16) The Story of Health and its care.

Attached to the museum, there should be a Planetarium.

The Natural History, Art and History of the Province of Delhi should be represented in the reserve collections of the National Museum. In addition, collections of Art and History from all over India could also find a place. But as to the Natural History of India, only one or two groups of the animal kingdom, say Mammals or Birds, from all over India, need be kept here. Each of the Provincial Museums should concentrate similarly on some other group or groups from all over India. If this jurisdiction is not maintained, all the museums would compete with one another resulting in too much unnecessary destruction of life. If this plan is adopted, a specialist would know which museum he has to visit to study his particular speciality. Besides the necessity of maintaining reserve collections on the lines mentioned above, the National Museum has several other duties to perform, the most important of which are:—

1. To have collections from almost every corner of the globe, first from places with which it has direct contact and later from lesser known places. The National Museum of India should not merely be a collection of objects. It should also be a challenge to the artistic skill, technical ability, spirit of adventure, ingenuity and hardihood of India's sons. All these should find expression in this museum, which has to be the finest product of her culture. Her sons should sail the seven seas, scale the highest mountains and explore the wildest country to enrich the national collections.

2. To maintain a preparation department with initiative, courage and the resources to experiment and evolve the most effective methods of presentation. The results of such studies and techniques should be at the disposal of every museum in the country.

3. To undertake to train museum personnel in (*i*) the care and maintenance of collections; (*ii*) cataloguing and registereding and other methods; (*iii*) preservation of the varius classes of specimen; (*iv*) prepartion and modern installation methods; (*v*) Administration and (*vi*) Services.

4. Each of the Provincial Museums should endeavour to teach the common man something about himself and his environment. The Story of Health and everyday science should be compulsory sections, along with a small observatory and accessories.

5. Historic site museums and Park museums should be established wherever possible.

6. The Museums Associations of India be strengthened and a journal started.

The museum has been described as the ordinary man's university. A nation prospers only to the extent to which its common people prosper. So, the more universities of this kind, and more graduates from this university we have, the better it would be for our country.

N. G. PILLAI.

"Gokulam,"
Nantencode,
Trivandrum,
September 28, 1948.

The writer was in the United States of America from May 12, 1947 to May 7, 1948, on deputation by the Government of Travancore to study museum methods in the country. He wishes to express his gratitude to the Travancore Government for making this opportunity available to him; and also to Mr. C. J. Hamlin, President of the International Council of Museums Dr. A. E. Parr, Director of the American Museum of Natural History, New York, Dr. L. V. Coleman, Secretary of the American Association of Museums, Washington, D. C., and to the Directors and staff of the various institutions he visited, without whose generous help his sojourn in the States would not have been as smooth and as profitable as it has been.

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WE wish to offer our heartiest felicitations to Sir C. V. Raman, Kt., F.R.S. N.L., on his appointment as the first National Research Professor in India, in recognition of his unique services in the cause of Science.

STANDARDISATION IN INDUSTRY

IN the course of his Presidential Adress to the third meeting of the General Council of the Indian Standards Institution, the Hon'ble Dr. Syama Prasad Mookerjee declared, "The Government of India, by its declared Industrial Policy", "has undertaken definite responsibility for the development of certain sector of industries and has also postulated a definite pattern of control in respect of others. Consequently, certain inescapable responsibilities in respect of development of standards clearly fall on the Government. At the same time, the industry must also be prepared to play its part enthusiastically and efficiently."

"So far as present indications go, we have good reason to be hopeful of the future. Indian industry is gradually but steadily becoming conscious of the importance of standardisation. It is being increasingly felt that without the initiation of standards and quality control, our industry cannot survive the onslaught of foreign competition.

Industry is in fact already financing the Institution about three times the extent that was initially estimated by us. It is a natural expectation that as the ISI publishes a growing number of standards, the industry will more and more appreciate the services rendered by the Institution and will come to recognise it as their own organisation to serve their own interests. Possibly at some stage the ISI will be called upon to organise an enforcement branch as well, as is being done in Canada for example, in the case of elcetrical appliances. This will require not only greater co-operation of industry but also legislative support.

"I am glad to note that in the sphere of international organisation standardisation the ISI has now begun to take an active part. The report of the Director which has recently been circulated to you, indicates the scope and extent of this participation. With respect to special responsibilities of India as the Secretariat for two of the ISO Technical Committees, it may be noted that 9 member countries of ISO have agreed to be members of the Shellac Committee, while the ISO Secretariat Committee for Mica has drafted the scope of international work, which is now being circularised to all ISO Member countries. Ever since the cessation of hostilities in Europe, mica producing interests in India have been opposed to the introduction of standards in his most important commodity of international trade, which earns valuable dollar exchange for the country. It is therefore gratifying to note that Indian Mica Industry has now responded favourably to the need of the time."

PRESERVATION OF PANCREAS-GLANDS WITHOUT REFRIGERATION

AT present, and possibly for many years to come the pancreas glands of slaughtered animals and of fish are the only source of insulin. During and after the war, insulin producers have had great difficulty in recovering their raw material, mainly because of the absence of appropriate refrigeration installations.

Unless the glands are processed without delay, or refrigerated at low temperatures (-20° to -30° C.,) their insulin content is rapidly lost. To find a means of preserving glands without refrigeration was therefore a problem of great importance.

After many unsuccessful experiments, a new process has been developed in the laboratories of the Farbwerke Höchst which answers these requirements.[1] This process is based on the principle of converting the pancreas-glands into a stable dry product by treating them with an anhydrous salt which binds their water content as water of crystallization. Anhydrous sodium sulphate is normally used for the purpose. As 142 grammes are required to bind 180 grammes of water, approximately 600 grammes of the salt are theoretically necessary to bind the water contained in 1 kilogramme of pancreas. In practice, however, 700 grammes are required. The dry preparation may be maintained at the degree of acidity required, for instance pH 5, by the addition of sodium hydrosulphate, tartaric acid, or any other suitable agent.

The idea of DEHYDRATING an organ in order to preserve it is not new.[2] But although the principle has already been applied by several workers to the preservation of pancreas[3], it has not so far yielded good results, mainly because these workers failed to recognize that it was essential that the glands should be disintegrated rapidly and thoroughly and treated with an anhydrous salt not after, but during, the disintegration. This process is most suitably performed in rapid cutting-machines of the type found in most butchers' shops.

The cutter consists of a rotating dish with a set of rapidly revolving sickleshaped knives which simultaneously perform the disintegration and mixing, the pancreatic tissue being cut and its surface immediately brought into contact with the salt. One of the advantages of this new method is that since it is simple and safe, it can be applied without special training by the personnel of slaughter-houses.

In a large cutter, 12 to 15 kilogrammes of glands can be processed at a time, and in the smaller cutters commonly found in butchers' shops, 8 to 10 kilogrammes. The glands should be collected and prepared as soon as possible after slaughtering, and then be kept in cold storage (5-8° C) until they are processed (not later than the same day). They are spread uniformally in the dish of the cutter and covered with 700 grammes of anhydrous, finely-ground sodium sulphate for each kilogramme of pancreas. The machine is then set in motion. After 8 to 10 minutes a homogeneous and rather compact mass is obtained and placed on iron sheets in a layer about 5 centimetres thick. The mass is then left for about one hour and taken into the refrigeration chamber for cold storage. By the next morning the cake will have solidified into slabs which are so hard and compact that they can be piled up without any special care.

If the batches are too large and processing is delayed, difficulties are likely to arise, because the mass solidifies too rapidly.

The preparation obtained must be stored in as dry place as possible at a temperature of 5-8° C. (cold storage). Under these conditions even after six months in storage, no loss of insulin occurs; even storage at normal room-temparature—provided that it does not rise to 30°C—is tolerated for several days without damage, which gradually facilitates transport.

Insulin is obtained from this preparation in the usual way, with the same yield as is usually obtained from frozen glands.[4]

By applying the process described above, the Farbwerke Höchst were able to double the number of slaughter-houses from which they obtain the necessary pancreas glands for the production of insulin. It may be said that the new method has so far stood every test and has done much to stave off the worst consequences of the insulin shortage for diabetics in Germany.

(Courtsey of Chronicle of the World-Health Organisation, July 1948, p. 153).

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1. Application for German Patent No. 75?15 IV a/30h filed on 21 June 1943. 2. See Frankel, in Abderhalden, *Handbuch der biologischen Arbeitsmethoden.* Hamburg, 1926-40. Sect. I. Part 6. p. 4. 3. See German Patent No. 441614 and British Patent No. 188680. 4. Some difficulties in centrifuging were experienced at the beginning owing to the salt content of the preparation.

COMMERCIAL TIMBERS OF INDIA

TO bring to the notice of the public in these days of shortage of raw material, some more Indian timbers of great commercial potentialities, the Forest Research Institute, Dehra Dun, has published a brochure "Some More Commercial Timbers of India" in its new Utilisation Series. The publication deals with 28 timbers. some of which proved very suitable for various purposes during the last World War, when there was an unprecedented demand on the timber resources of India.

Before the War, the use of these timbers was restricted either because the forests in which they are grown were not easily accessible, or because their commercial possibilities had not been explored in peace time. The new publication gives a general idea of the possible uses of these timbers based on experiences gained during the war period particularly in four inrections: for general constructional work including carts and carriage building, for plywood packing cases and light furniture; for tools handles and for shuttles, toys and decorative articles.

CYTOGENETIC CHANGES AND ATYPICAL GROWTH INDUCED BY HEXACHLOROCYCLOHEXANE ($C_6H_6Cl_6$)

DONTCHO KOSTOFF

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SCIENTISTS occupied chiefly with applied science, especially such working in the fields of agronomy and medicine, often demanded with right, from the cytogeneticists, when they work on some theoretical problems to pay attention at the same time to the practical outcome of their studies giving sufficient theoretical background for elucidation of the methods adopted in the applied work. Having often heard such reproaches from various sides I have occasionally directed some of my studies to satisfy, as far as possible, some of the demands of the applied sciences. The results of such a recent study I have summarized and should like to report them. I shall mention here that the investigations are not yet completed in many respects but there are many points that deserve to be reported even at this stage of development.

The work of cytogeneticists and plant-breeders can often be methodically criticised when they treat material with certain insecticides or fungicides in order to protect their experimental material from parasites, but without considering the cytogenetic effect of chemicals applied in such cases.

The best insecticides and fungicides will be those which kill the plant parasites without affecting the plant organism. In fact they all affect more or less the host plant in various ways and degrees.[1,4] A series of fungicides and insecticides have similar effects on the plant organisms. Ethyl-mercury chloride (CH_3CH_2HgCl) for example, which is the active substance (2%) of the fungicide "Granosan", induces atypical growth, abnormal mitosis and polyploidy[3,4] reminding the effect of colchicine and acenaphthene.[5,6] Similar and at the same time very strong effect of this kind has hexachlorocyclohexane—another chlor-organic compound, recently recommended under various names. The insecticides "Agrocides", 7,3 etc., for example. the active substance of which is gamma isomer of 1,2,3,4,5,6-hexachlorocyclohexane, induce atypical growth suppressing the development of the roots, stems and coleoptyles of *Gramminous* plants, conditioning very striking thickening of these organs, especially of the growing points (roots, stems and coleoptyles).

Active insecticides, manufactured in various countries (hexachlorane, 666) and containing several isomers of hexachlorocyclohexane, including the gamma isomer, act in a similar, though not in an identical way. Hexachlorane, for example, stimulates the germination of certain *Cruciferæ* (*Brassica nigra*) and other plant seeds during the first two days of germination, so that they were even ahead in growth, when compared with the control samples and much ahead when compared with the germinating seeds treated with "Agrocide 7". But soon after this, the controls grow further, while the growth of the treated seedlings becomes strikingly suppressed. Some of the data of this material are given in Table I.

TABLE I

Suppression of the growth by hexachlorane and agrocide 7. Length in mm.

	Germinating seed of	Untreated control in mm.	Treated with hexachlorane in mm.	Treated with Agrocide 7 in mm.
1	*Zea mays* (roots) ..	22·03	12·07	8·90
2	*Panicum miliaceum* (coleoptyles)	10·00	4·76	3·32
3	*Pisum orvense* (roots) ..	23·21	9·62	7·73
4	*Cannabis sativus* (stem and cotyledon)	21·19	15·98	12·72
5	*Brassica nigra* (stem and cotyledon) ..	29·46	8·40	5·31
6	*Secale cereale* (roots) ..	20·46	2·65	1·33
7	„ „ (coleoptyles)	41·30	4·75	2·81

We have treated with insecticides containing hexachlorocyclohexane germinating seeds of the following plants: *Zea mays*, *Triticum vulgare*, *T. monococum*, *T. compactum*, *Secale cereale*, *Setaria italica*, *Panicum miliaceum*, *Helianthus annuus*, *Crepis capillaris*, *Vicia faba*, *V. sativa*, *Pisum sativum*, *Brassica nigra*, etc.

The cytological studies of the affected root, stem, and coleoptyle tissues show that the *agents act first of all upon the cytoplasm and interfere with the cytoplasmic processes* involved in the formation of achromatic figures. The chromosomes do not arrange in an equatorial (metaphasal) plate after prophase, but remain scattered approximately as they are during the prophase. They appear less bent than usually. The "thickening" of the chromosomes and their reproduction and splitting proceeds although the process involved in the formation of achromatic figures are highly disturbed or even entirely inhibited. The chromosomes thus reproduce, but remain where they are, without moving toward the poles. In fact, poles are not formed After such a reproduction, the chromatolythic (nucleoproteolytic) processes proceed and nucleus is formed containing twice as many chro nosomes as before the beginning of the abnormal mitotic processes. The main trend of the processes conditioning chromosome doubling resemble those induced by colchicine, acenaphthene and other polyploidizing agents.

Since the insecticides continue to act further, the next abnormal Ab-mitosis ends with second chromosome doubling and so on. Thus tetraploid and octoploid cells are formed and even cells of a much higher degree of polyploidy. Along with these, certain diploid cells, that have not yet undergone Ab-mitosis can be still found.

Chromosome multiplication leads to the increase of the size and occasionally of the number of the nuclei and further to the increase of the size of the cells. Thus the cells grow instead of multiplying and differentiating resulting in the swelling of the roots, stems and coleoptyles.

The chromosome reproduction and separation in *Zea mays* should be considered as a somewhat special case. We have observed in a series of cells that the chromatids of the somatic chromosomes are bent at the centromeres reciprocally to each other, each one, like V, thus both halves forming rather a X, the chromatids being attached at the centromere. These figures can be interpreted by postulating certain repulsion forces existing between the chromatids, the reproduction (rather the division) of the centromere, being somewhat delayed. This phenomenon occurs when the achromatic figure is highly or completely disturbed. In other words, it does not seem to be regulated to any extent by the forces evolved from the achromatic figure.

If we compare the polyploidizing potency of hexachlorocyclohexane with that of acenaphthene, we can with certainty affirm, that in *Gramineæ* the activity of both agents is approximately the same. Acenaphthene as polyiploidizing agent in leguminous plants, is not effective enough, while the activity of hexachlorocyclohexane is much more effective and we obtained in *Pisum* swellings resembling those induced by colchicine, as well as cells and tissues in *Vicia faba* having various degrees of polyploidy.

The solubility of hexachlorocyclohexane in water is very low, therefore, it is applied in the form of small solid particles. The particles act when they are in contact with the plant tissue. It has a specific smell, but the experiments failed, when it was tried to induce specific atypical growth from a distance. In this respect its effect differs from that of acenaphthene, the sublimating particles of which act from a distance even when the crystals are not in contact with the plant tissue. Floral buds of *Nicotiana tabacum* and raddish covered with hexachlorocyclohexane (mixture of various isomers), Agrocide 7, or hexachlorane showed none, or very few disturbances in the meiosis, as for example, occasional univalents and laggards or slight irregularities in the arrangement of the chromosomes in the equatorial plate, which probably may be due to a sequence of disturbances in the achromatic figure. Contrary to the very well expressed effect of acenaphthene upon meiosis in *Gramineæ* hexachlorocyclohexane does not affect, or its effect is quite insignificant upon meiosis in rye, when spikes were abundantly covered with Agrocide 7, Hexachlorane or mixture of isomers of hexachlorocyclohexane and inserted into test-tubes for 24 hours. Spikes of rye plunged into test-tubes with saturated solutions with some excesses of these substances, did not show significant effect, i.e., significant disturbance in the meiotic processes. Similar experiments were carried out with tobacco and leguminous plants with similar results.

All these observations suggest that hexachlorocyclohexane acts upon the plant cells when its particles are in near contact with the tissue.

The pollen mother cells, being protected, first of all, by the tissue of anther and then by the corolla and callyx tissues (or by the glumes in rye) are not effectively affected by the agent.

Experiments were also carried out with yeast in the following way: Sterile grape juice was inoculated with pure culture of yeast to some of the flasks Agrocide 7 was added, to others Hexachlorane and to yet others hexachlorocyclohexane (mixture of isomers). After 24 and 96 hrs. no striking changes in the size of the yeast cells were observed and when compared with the controls the fermentation in the treated cultures being somewhat suppressed and later completely inhibited.

Preliminary experiments were conducted with caterpillars of *Limantria dispar*, to study whether the agent acts upon the caterpillars first as polyploidizer, and the death being as a subsequent effect of it. But the observations, hitherto carried out, do not seem to support such supposition. The studies in this line are now continuing.

The effect of hexachlorocyclohexane upon the somatic tissues of the plants is so striking that it can be used as polyploidizing agent, especially when one considers the fact that it is much cheaper than other polyploidizing agents. We are now carrying out further experiments in this direction.

In studying the disturbances in the mitotic processes induced by hexachlorocyclohexane we have found that in certain cases chromosome group or groups may move slightly in some direction or directions into cytoplasm. Such a slight separation may occasionally end in the formation of two or more than two aneuploid nuclei. Thus polynucleate cells or cells with monstrously deformed nuclei appear. In certain cases between such nuclei, a cell wall is formed. This leads to formation of cells with aneuploid chromosome numbers. Dead cells were occasionally found in the roots, stems and in the coleoptyles. They may have been aneuploid.

All these phenomena leading to polyploidy or aneuploidy are due to the activity of the agent upon the cytoplasm.

But the active agent, i.e., hexachlorocyclohexane also induces certain changes in the nuclear elements, i.e., in the chromosomes, no matter how rare they may occur. Fragments of one chromatid or of chromosomes (both chromatids) were also observed, although very rarely.

Such insecticides or fungicides, when applied, may increase the hereditary changes in the cultivated "pure lines" leading thus to more rapid degeneration of the highly bred uniform varieties. This means that when one applies such insecticides or fungicides one should more frequently change the seeds of the varieties which he propagates, by using a fresh non-degenerated stocks.

Thanks are due to Dr. Manol Stoylov for help throughout this work.

1. Kostoff, D., "Degeneration of the Pure Lines." Sofia, 1930 2. —, *Bull. Soc. Bot. de Bulgarie*, 1931, **14**, 87-92. 3. —, *Nature*, London, 1939, **144**, 334. 4. —, *Phytopath. Zeitschr.*, 1940, **13**, 91-96. 5. —, *Compt. Rend.* (*Doklady*), *Acad. Sci. USSR.*, 1938, **19**, 189-92, 6. —, *Journ. Genet.*, 1940, **39**, 469-84.

LETTERS TO THE EDITOR

ELASTIC CONSTANTS OF SINGLE CRYSTALS OF BARIUM NITRATE

In a recent note, now under publication in *Nature*, it has been reported from this laboratory that the photo-elastic behaviour of barium nitrate crystals is exceptional in many ways. It is considered desirable to obtain the elastic constants of these crystals as no such data are available in literature. Necessary sections have been prepared, and the following results obtained by employing the ultrasonic wedge method developed here.

$C_{11} = 6{\cdot}02$; $C_{12} = 1{\cdot}86$; $C_{44} = 1{\cdot}21 \times 10^{11}$ dynes/cm.^{2}

Plates of different thicknesses and wedges of different shapes have been used for confirmation in each case.

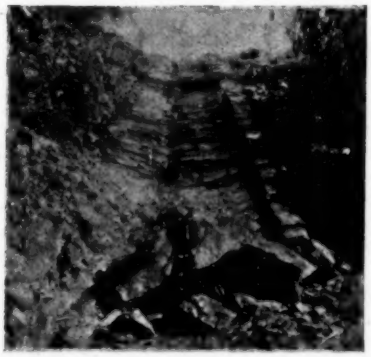
Dept. of Physics, Andhra University, Waltair, *October* 1, 1948.

S. Bhagavantam.
R. V. G. Sundara Rao.

A REMARKABLE EVIDENCE OF A LOCAL THRUST PLANE AT THE TOP OF THE PURPLE SANDSTONE SERIES IN THE SALT RANGE

During our last excursion in November 1946, we came across an interesting thrust plane surface on the lower slope of the right (northern) ridge of the Gandhala gorge, S.W. of Choa Saidan Shah (Salt Range). The exact locality is where the foot-path called 'Majhi Chanewala rah,' running up along the outcrop of the Purple Sandstone from near the District Board Gardens in the gorge, passes between the two hills locally known as 'Jhangala and Othiawala'. As we climb up the spur along this foot-path and come to the top bed (a pebbly sandstone) of the Purple Sandstone series, we see a polished, more or less ridged and grooved, corrugated surface. This surface is over an area, about two yards wide and about seven yards long. It is likely to be mistaken at first sight for an artificially made surface, with drains having polished

cemented sides, the gritty conglomeratic stuff in the grooves suggesting as if the drains are filled with cement concrete (see the photo). The senior author was struck by its resemblance to the surface structures observed at places along the great Moine thrust plane in Scotland.



It may be mentioned in this connection that there runs a great thrust-fault along the foot of this spur which has brought the Kamlials in bottom of the valley against the Purple Sandstone of the spur, and that the Purple Sandstone is overlain by the Neobolus shales and other stratigraphical formations characteristic of the eastern part of the Salt Range.

According to Dr. Gee, pebbly bed at the top of the Purple Sandstone series is widespread and is a normal horizon of the series. We met Dr. Gee at Khewra at that time; and during two of his excursions, he showed us this pebbly bed in the Dandot gorge as well as in the Khewra gorge. The typical thrust plane structure seen by us at the above locality can, therefore, be only regarded as local. The Salt Range is now politically out of bounds to Indian geologists, but the Pakistan geologists can investigate this thrust plane in detail.

Dhanbad, N. L. SHARMA.
September 17, 1948. K. C. LAHIRI.

THE HOME OF MONAZITE IN THE VIZAGAPATAM AREA

IN a recent paper,[1] the occurrence of monazite, zircon and other minerals in the beach sands of Vizagapatam was described. Subsequently, on a study of the origin of the Waltair Highlands by the authors of this note (under publication), the monazites were traced to the alluvium in the streams flowing down the hill ranges of this area. In order to fix definitely the home of this monazite, a very careful examination of the pegmatite veins which cut through the khondalites underlying the red loam of the Waltair Highlands was made. These pegmatites consist of grey, pink, and white felspars, white and bluish quartz, small books of biotite mica, opaque iron ore minerals, and some dark minerals with greenish tinge and sub metallic lustre. The pegmatites occur as lit-par-lit injections, veins, or sometimes as lenses and veinlets in the khondalites. Representative samples from four different pegmatites were pulverised and passed through 60-mesh sieve, and panned. In all the samples, the tailings show considerable quantities of monazite and zircon. The monazite is easily distinguished in the concentrates by its greenish yellow colour. The dark mineral with submetallic lustre occurring in the pegmatites was tested by physical and optical methods and identified as monazite.

Though granites occur in the vicinity of the khondalites as intrusives, the pegmatites do not show intrusive relationship with the granites. It is of interest to recall that Masillamani and Chacko[2] and also Masillamani[3] recorded the occurrence of monazite in pegmatites which are intrusive into the khondalites and charnockites in some areas in Travancore. Tipper[4] is of the opinion that the bulk of the monazite in the shore sands is derived from the gneisses of Travancore. Detailed investigations are in progress extending the enquiry to other areas and formations. The results of the investigations carried out so far show that in the Vizagapatam area, the pegmatites cutting through the khodalities carry the bulk of the monazite.

Department of Geology, C. MAHADEVAN.
Andhra University, N. SATHAPATHI.
Waltair,
September 28, 1948.

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INFLUENCE OF DIETARY FACTORS ON THE ENDOGENOUS CALCIUM EXCRETION IN THE ALBINO RAT

EVEN on a calcium-free diet, there is a small but distinct negative calcium balance as evidenced by the results of Jones.[1] The measurement of this endogenous calcium excretion is necessary while studying the availability of calcium. It is known that protein, fat and phosphorus in the diet influence the absorption and utilisation of calcium.[2, 3, 4] The effect of these dietary constitutents on the endogenous calcium excretion in the white rat forms the subject-matter of this note. These data would be of value in studying the physiological interrelationships that exist in the metabolism of calcium on the one hand and these dietary factors on the other.

Six healthy adult rats were taken and their normal endogenous calcium excretion was measured for a period of one week. During this period they were fed on a diet adequate in all respects but free from calcium.* After keeping them on a normal stock diet for one week they were given three other diets which apart from

(Values represent calcium excreted in mgm. for a period of one week)

Rat No. and sex	Calcium free diet			Calcium and protein free diet			Calcium and fat free diet			Calcium and phosphorus free diet		
	Urinary	Faecal	Total	Urinary	Faecal	Total	Urinary	Faecal	Total	Urinary	Faecal	Total
1 M ..	6·3	23·6	29·9	5·3	29·9	35·2	7·8	38·7	46·5	9·7	38·8	48·5
2 M ..	5·8	20·3	28·1	5·9	25·1	31·0	6·2	35·1	41·3	9·6	37·1	46·7
3 M ..	7·5	25·1	32·6	7·2	30·4	37·6	8·6	39·8	48·4	10·2	86·5	49·7
4 M ..	4·9	22·1	27·0	5·6	27·8	33·4	7·2	36·1	43·3	8·1	35·2	43·3
5 M ..	5·6	25·6	31·2	5·6	29·2	34·0	6·7	37·2	43·9	6·5	32·7	39·2
6 M ..	5·4	19·8	25·2	5·9	20·6	26·5	7·2	30·4	37·6	7·5	31·6	89·1
Average	5·9	22·8	28·7	5·9	27·2	33·1	7·3	36·2	43·5	8·6	35·3	43·5

being free from calcium were deficient in protein, fat and phosphorus respectively. Between successive experimental periods the rats were kept on the normal diet for one week. The calcium excretion of the rats on these diets was also measured.

Urinary calcium was measured according to the methods of Shol and Pedley.[5] Fæcal calcium was estimated by the method of McCrudden.[6] The data for calcium excretion of individual rats are given in the above table.

The effect of protein, fat and phosphorus on endogenous calcium excretion is evident from the above data. The absence of protein in the diet does not affect urinary calcium excretion. But fæcal calcium and the total endogenous excretion are slightly increased. The withdrawal of fat or protein increases both urinary and fæcal excretion. The fæcal calcium particularly is increased to a very large extent.

These results therefore show that under conditions of calcium deprivation or very low calcium intake, protein and phosphorus have a calcium sparing action. They also lend support to the fact that for efficient calcium utilisation, moderate amounts of protein fat and phosphorus are necessary in the diet. The increased urinary excretion is due to the withdrawal of calcium from the bones leading to an excretion through the renal channel. The origin of the increased fæcal excretion is not definite. Experiments are in progress to see whether this calcium has originated from the digestive juices or is due to the pouring in of calcium from the blood stream to the lumen of the gastro-intestinal tract as suggested by Steggarda, *et al.*[7]

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July 25, 1948.

* The composition of the calcium free diet was. corn starch 51, cane sugar 20, cocoanut oil 10, casein (freed from calcium according to Jones)15, and calcium free salt mixture 4. The diet was supplemented with vitamins A. D. and also the vitamins of the B complex group. The diet contained 6·2 mgs. calcium/100 gms.

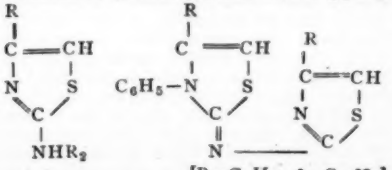
1. Jones, J. H., and N. E. Cohn., *Jour. Nut.*, 1936, **11**, 296. 2. McCance, R. A., Widdowson, E. M., and H. Lehmann., *Biochem. Jour.*, 1942, **36**, 686 3. Jones, J. H., *Jour. Nut.*, 1940, **20**, 367. 4. Bauer, W. Albright, F., and Aub., J. C., *Jour. Clin. Invest.*, 1929, **7**, 75. 5. Shol, A. T., and Pedley, F. C., *Jour. Biol. Chem.*, 1922, **50**, 537. 6. McCrudden, F. H., *Ibid.*, 1911–12, **10**, 187. 7. Steggarda, F. R., and Mitchell, H. H. *Jour. Nut.*, 1946, **31**, 423.

Note.—It is to be noted that the values for endogenous calcium excretion in the above cases are rather high being about twice as much as the figures reported by Jones. The traces of calcium present in the diet cannot however completely explain the rather higher calcium excretion in these cases.

SOME NEW AMINOTHIAZOLES

THE discovery by Smirk and McGeorge[1] of the remarkable blood pressure raising property of S-methylthiourea sulphate and the discovery by Rose et al[2] of the promising local anæsthetic property of thiazole derivatives led us to the synthesis of a few new compounds of types (A) and (B) which could be considered as cyclised derivatives of both S-methylthiourea and of aminothiazole and hence would be possible pressor anæsthetics.

Following the known methods[3,4,5,6] compounds 1, 2, 3, and 4 (Table 1) were prepared by refluxing phenacylbromide with *m*-and-*p*-nitro as well as *o*-methoxy-phenythioureas and *β*-naphthyl thiourea respectively and isolating the products and purifying them from suitable solvent. The action of thiourea on 3:4:5—triacetoxy *ω*-bromoacetophenone led to the formation of 4- (3′:4′:5′ triacetoxy)-phenyl-2-aminothiazole which was isolated as its hydrobromide 5 (Table I) the base being unstable. The reaction of phenyldithiobiuret with phenacyl-and *β*-napthacylbromides even when conducted in monomolecular proportions led to the formation of substituted 2-thiazolyl 2′-iminothiazolines (1 and 2, Table II) of type (B).



Type A Type B

TABLE I

No.	R_1	R_2	m.p. °C.	Empirical formula	Nitrogen Per cent	
					Found	Calculated
1	C_6H_5–	*m*-$C_6H_4NO_2$	165	$C_{15}H_{11}O_2N_3S$	14·1	14·1
2	C_6H_5–	*p*-$C_6H_4NO_2$	202	$C_{15}H_{11}O_2N_3S$	13·6	14·1
3	C_6H_5–	*o*-$C_6H_4OCH_3$	195	$C_{16}H_{14}ON_2S$	10·0	9·9
4	C_6H_5–	β-$C_{10}H_7$	127	$C_{19}H_{14}N_2S$	9·1	9·2
5	3 : 4 : 5-$(CH_3CO\cdot O)_3C_6H_2$–	H	171	$C_{15}H_{15}O_6N_2S$ Br	6·5	6·5

TABLE II

No.	R_1	R_2	m.p. °C.	Empirical formula	Nitrogen Percentage	
					Found	Calculated
1	C_6H_5		227	$C_{24}H_{17}N_3S_2$	10·2	10·2
2	β-$C_{10}H_7$		242	$C_{32}H_{21}N_3S_2$	8·2	8·2

Org. Chem. Laboratories,
Bangalore. M. V. BHATT.
Indian Institute of Science, B. H. IYER.
September 17, 1948. P. C. GUHA.

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A SIMPLE METHOD OF ISOLATING MUSTARD EMBRYOS AND THEIR CULTIVATION

IT was demonstrated by Gregory and Purvis,[1] working with rye and Sen and Chakravarthi[2] with mustard that the seat of vernalisation changes is the embryo. The endosperm of rye and cotyledons of mustard do not play any part in the process.

This observation makes it clear, that for an understanding of the mechanism of vernalisation it is the embryo that should be subjected to critical study and for any progress the method of its isolation must be very simple and rapid, and that of its cultivation easy. The method decribed below for mustard satisfies these conditions.

A small sample of sun-dried large sized mustard seed is taken in a pestle and rubbed lightly with a mortar. Due to pressure the cotyledons break and the embryos get separated. With the help of a slanting piece of glass unsplit seeds are separated from the broken ones and again subjected to the process of rubbing. This could be repeated till there are very few seeds left. The preliminary separation of the embryos from the broken cotyledons could be done either by passing them through a sieve of appropriate mesh or by light winnowing. The final selection has got to be done by careful hand-picking and observing each apparently normal embryo under a dissecting microscope for any cleavage. These embryos could then be stored inside a desiccator for more than a month without losing their viability.

Out of the seeds of the different varieties tried it was found that yellow *sarson*, T. 102, on account of its thinner testa which is more or less loosely attached to the cotyledons, could be handled more easily than the others.

The embryos were first cultivated in a nutrient medium (Purvis modification of white's nutrient solution *plus* 2% sucrose)[3], but soon this method was discarded as they were found to grow directly on soil or even on filter paper soaked with tap water. The isolated embroys were sown in pots containing well manured finely sifted garden soil and watered from below by putting the pots in dishes containing water. The growth of the seedlings, however, was slow as ompared to those in the nutrient medium. The technique adopted and precautions taken are just similar to the raising of seedlings of small seeded plants like poppy, tobacco, etc.

An attempt to grow isolated embryos of wheat on the other hand, resulted in utter failure. No growth was observed in tap water until and unless the embroys were supplied with a small quantity of sucrose, while the mustard embryos grew well for some days even in glass distilled water.

This observation is interesting as the percentage of sucrose in the wheat (Pb 9-D) embryo-samples worked with was found to vary from 5·6 to 6·1% while it was absent in the embryos of mustard T. 102. Normally it is the mustard embryo that ought to have required sucrose for germination and not wheat. This presence of sucrose is also essential for the maximum vernalisation of rye embryos[3] but it is not so far the embryos of mustard[2] which, would germinate as well as vernalise quite successfully even in glass distilled water.

I have not so far come across a parallel case and would greatly appreciate if some workers could let me know cases of isolated embryos capable of germination and indepedent establishment in the absence of any nutrients.

It is my most pleasant duty to express my indebtedness to Mr. Boshi Sen, Director, Vivekananda Laboratory, Almora, for so kindly providing me the facilities for this work.

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Balwant Rajput College,
Agra,
October 2nd, 1948.

1. Gregory, F. G., and Purvis, O. N., *Ann. Bot.*, 1938, **2**, 237. 2. Sen, B., and Chakravarti, S. C., *Nature*, 1947, **159**, 783. 3. Purvis, O. N., *Ann. Bot.*, 1944, **8**, 285.

THE EFFECT OF THE CULTIVATION OF BRASSICAE OIL-SEED CROPS ON THE SOIL FERTILITY

OIL-SEED crops occupy about 25 million acres annually in India (undivided) and the principal crops are groundnuts, linseed, brassicæ (mustard group), sesamum and castor. The groundnut and castor crops are practically confined to peninsular India, linseed is spread over the peninsular India and the Indo-Gangetic plain while brassicæ crops consisting of *torio*, *sarson* and *rai* are chiefly grown in the Indo-Gangetic alluvium with annual area of about 5·5 million acres. Sind, the fertile valley of the river Indus, has increased considerably the cropping area after the advent of the canal system which made the water available perennially. The substantial increase in area was expected to be under *rabi* cropping. The main *rabi* crops in Sind are wheat and the brassiacæ oil-seeds, besides gram and *lathyrus* which are either grown as second crop after rice or in the *katcha* lands (river inundation tracts). These brassicæ oil seed crops having a wide range of sowing form an important factor for the full and economic utilisation of the water under the irrigated conditions. The increase in area under these brassicæ crops has not been substantial mainly due to the general belief among the cultivators throughout India, though not substantiated, that the oil-yeilding crops are heavy feeders and exhaust the soil, adversely affecting the yield of the succeeding crop. Hence these crops are not usually included in the regular crop rotations. This greatly handicaps any attempt to increase the area under these oil-seed crops.

With a view to ascertaining the effect of cultivation of these oil-seed crops on the yield of the following crops, a series of field experiments were laid out at Dokri (Sind) during the years 1944-46. The data obtained from these experiments not only indicate the influence of the cultivation of oil-seed crops on the yield of the succeeding crop as compared with wheat but also furnishes the data for fixing the suitable rotation for the irrigated areas as the rotations are generally based upon the accumulated experience and results of the crop sequence experiments.

The experiments comprised of three sets. In each set the basic crops, *viz.*, *torio*, *sarson* and wheat with fallow as the control were grown during the *rabi* season. Cotton, Jowar and wheat were grown on the same area in different sets as succeeding crops to gauge the exhausting effect of the previous crops on the soil during the year. Each set was a complete experiment laid out according to randomized block system with five replications, the ultimate size of the unit bed being 1/50th of an acre. The experiment was conducted for two years. The results are presented in the following table.

Basic crop \ Succeeding crop	Mean yield per acre in lbs.					
	Cotton (M4)		Jowar (Soaro Kartuho)		Wheat (At 38)	
	1944–45	1945–46	1944–45	1945–46	1944–45	1945–46
A—*Torio* ..	1014	868	451	819	1221	1896
B—*Sarson* ..	1054	852	472	778	1346	1854
C—Wheat ..	768	675	335	560	1320	1620
D—Fallow ..	1580	1149	362	923	1554	1748
F value ..	12·96†	3·49*	2·47	2·70	·81	3·4
Conclusions	D > A = B = C	D > A = B = C	..	..	..	..

* Exceeds the 5% level of significance.

† Exceeds the 1% level of significance.

From the above table it is evident that the yields of crops following the fallow are the highest and those after wheat are the lowest. However, the yield differences in case of jowar and wheat crops were not found to be statistically significant during both the seasons indicating that the growing of *torio* or *sarson* crop has no adverse effect on the yield of the subsequent crops. Another interesting fact is noticed that for shallow rooted crop like jowar or wheat previous fallow is not necessary. However in case of wheat crop the plots were lying fallow during the intervening *Kharif* season. In the case of cotton crop the yield differences were found to be statistically significant during both the seasons. It is evident that yield of cotton following the fallow is significantly higher while the yield differences between other treatments are not statistically significant. Thus the cultivation of oil-seeds in the previous season has no adverse effect on the yield of cotton as compared with wheat. It is however clear that cotton following fallow gives better response.

The above results conclusively prove that the brassicæ oil-seed crops have no adverse effect on the yield of succeeding crops and could be well included into a regular crop rotation.

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December 12, 1947.
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BREEDING OF *MUSCA NEBULO* F. FOR BIOLOGICAL TESTS OF INSECTICIDES

BIOLOGICAL tests of insecticides, either for standardisation or a study of reactions, require a pure bred healthy race of insects a continuous supply of which is assured by breeding. Grady[1] bred *Musca Domestica* L. throughout the year and Peet and Grady[4] used these flies for tests with insecticides. Hockenyos[2] reared flies for a similar purpose and Musham[3] reared *Musca vicina* Coq. The food used was chosen frequently because of its odour being attractive to flies and the adult flies of the required standard were those emerged out of pupæ which were segregated.

Monthly data

Month	Average temperature at 10 A.M. °C.	Average percentage Humidity	Average temperature for 24 hours		Total No. of flies available for experiments for the month	Life-cycle days (average)
			Maximum °C.	Minimum °C.		
June 1947	32	82	32	30	14301	13—19
July ,,	31	85	31	28	12883	15—23
Aug. ,,	31	83	29	28	10677	9—15
Sept. ,,	31	84	29	28	12476	9—14
Oct. ,,	30	77	30	28	9321	9—13
Nov. ,,	31	68	31	29	10786	9—13
Dec. ,,	31	65	29	28	12313	9—15
Jan. 1948	28	68	28	27	12092	9—14
Feb. ,,	28	69	27	27	8576	9—13
Mar. ,,	30	68	30	28	9355	9—12
April ,,	31	74	31	27	8052	9—12
May ,,	31	74	32	28	10236	8—12
June ,,	31	78	31	27	16372	8—12
July ,,	30	85	30	29	13052	8—12

In the course of our studies in this laboratory during the past fourteen months the common Indian housefly *Musca nebulo* F. was bred continuously, the food adopted for rearing the flies being bran, banana, milk, glucose, vitamins D and E. Dishes with the eggs were kept in a specially designed cage where the entire life-cycle was completed. Adult flies were taken out of the cage and subjected to laboratory tests by means of specially designed apparatus.

The breeding was done entirely under laboratory conditions and the accompanying table shows the number of flies produced as well as other revelant details. The oviposition takes place after the fourth day of emrgence and the flies were used for tests on the fifth day.

Breeding took place in the light of an electric lamp. It has been observed that the egg-laying of the insects is affected by the different colours red, yellow and blue.

In tests with suitable insecticides these laboratory bred flies maintained a uniform standard of response under similar conditions. The female fly on an average is more resistant to insecticides than the male fly.

This method of breeding may be found useful in the genetical and cytological studies of these flies in particular and Diptera in general. Other details of some of our relevant work will be published elsewhere.

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October 2, 1948.

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CARBOY AS A CHINESE WORD

FOWLER AND FOWLER, in their Concise Oxford Dictionary, refer to carboy as a "large coloured bottle protected with basket-work". It is further mentioned as a modification of the Persian word Qarabah. Hadi Hassan, in his "History of Persian Navigation", indicates contact between Persia and the Far East even earlier than Islam so that a word in Persian could have come through Pehlavi of Pre-Islamic Persia or *via* Arabic after that period. Either as an Iranian word or as a loan word previously adapted into Pehlavi it could not have incorporated the Arabic sound of Qaf. It is therefore natural to assume that Qarabah was acquired into Persian during its Post-Islamic period.

Just as Indians have made English their literary language Persians then often wrote and spoke in Arabic. Platts in his Urdu English Dictionary also states that Qaraba is a Persian word but one which has been derived from the Arabic root, "Qarb", having the meaning "to be near". I have shown elsewhere that a genuine word is always connotative, whereas, a typical loan word, whose origin is not known, is disposed off as genuine after having been attributed to it a far fetched meaning. That a root meaning "to be near" should give rise to a derivative meaning carboy is like meat to a gymnast in specialised reasoning but like poison to one depending mainly upon one's common sense. Further a Persian derivative has an Arabic root!

A more probable root for deriving Qaraba would have been the Arabic word "Qarba" meaning Massak or Skin as given in *J. Bombay B. R. Asiatic Soc.*, July 1847, p. 355. The word Massack is in common use in India for a leather bag for watering. However, there seems to be an even better explanation.

Giles, in his Chinese English Dictionary, gives character No. 2321 as Ch'iu meaning, among other synonyms, "a Globe". He gives a few terms compounded with it, one meaning "the terrestorial Globe" and another "Spherical". The most striking attribute of a carboy is not that it is made of glass but that it is a large globe. On account of its being placed in a basket its glassy nature is not very evident.

Character No. 7297 is Lo and means "Deep open basket without cover or handles ; crate". On looking at a carboy the basket serving as a crate is the more prominent. What we see is only a "*Globe* placed in a *Basket*", and precisely

these two features are expressed in a Chinese term for carboy.

A typical basket is always assumed to have a lid or a cover. The word "Lo" expresses an open basket, a Basket which is a crate. The Chinese use a term of two words since one of them alone may not serve its purpose in a monosyllabic language. An ideal synonym for Lo is character No. 9435 or P'o. This word is briefly translated in Mac Gillivray's Dictionary, p. 723, as a Basket-Tray, clearly indicating that the basket is an open one, more like a tray than like a basket with a lid or cover. Lo-P'o then signifies a deep basket which is quite open.

Doolittle, in his English Chinese Dictionary, Vol. I, translates a Great-Globe-of Glass, as To-Po-Li-Chiu, where Chiu is the word for Globe discussed above. The above term of four words cannot designate therein a carboy, for the latter is inseparable from its container, a Basket Crate, which is not expressed therein.

The term Ch'iu-Lo-P'o would appear to be the ideal term for carboy as it signifies a Globe placed in a deep Basket-Crate which is open, more like a tray than like a typical basket. This translation is condensed into Globe-Basket crate-Tray, to represent Ch'iu-Lo-P'o. Now this term in Cantonese is pronounced K'au-Lo-P'o. Like a copyist who thickens the delicate lines of an original drawing foreign sounds get emphasised in a loan word. There is a tendency to reproduce sounds clearer than those in the original; hence the resultant is an exaggeration of subtle syllables. The aspirated K sound has been accentuated into the sound of Qaf which is quite natural to Arabic, so that K' au could become Qau. L is regularly converted into R hence Lo becomes Ro. P'o is a foreign sound to Arabic: F wold be nearest to it but its next best conversion into B gives even a clearer sound than F. Cultured Persians speaking Arabic, who probably had to arabicise the term K'au-Lo-P'o, with a developed taste for euphony could not tolerate Qau-Ro-Bo so that the ultimate change gave the more pleasant modification Qa-Ra-Ba with all syllables ending in "A". An attempt to pronounce the last two terms would at once convince how the refined Persian was justified in having taken a little license with the original. Here we may compare the Korean modification of the same term, which is Ku-Ra-P'a. This is even nearer to the Perso-Arabic modification than to the Cantonese term K'au-Lo-P'o. It thus indirectly supports the modification of K' au-Lo-P'o into Qa-Ra-Ba.

Summary.—Carboy is supposed to be derived from Qaraba, which is a Persian word with an Arabic root, meaning "to be near". It is really a loan-word from the Cantonese term K'au-Lo-P'o meaning Globe-Basket crate-Tray. Persians with Arabic culture modified it having taken license for the sake of euphony, into Qa-Ra-Ba or Qaraba. As a loan word from the Chinese, Qaraba appears as a proper connotative word while as a Perso-Arabic word it bears a far fetched meaning.

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BIOLOGICAL CONTROL OF SOME HEMIPTEROUS INSECT PESTS OF CROPS IN INDIA

In India there are several species of insects belonging to the families of Cicindelidæ and Coccinellidæ which are predators. Out of these two families of beetles, Coccinellidæ provides several species which are predaceous on aphids, psyllids and coccids. The insect pests belonging to this group of hemipterous insects cause very serious damage to Agricultural and Horticultural crops throughout India and it is necessary to explore the possibilities of controlling them through indigenous predators which are found in considerable numbers in the fields at the time of insect pest occurrence.

The following predaceous species of coccinellid beetles were collected at Kanpur during 1945-47.

1. *Coccinella sptempuctata* L.
2. *Coccinella sptempuctat* L. var. *divaricata*-Ol.
3. *Coccinella* 11 *punctata* var. *menetriesii* muls.
4. *Chilomenes sexmaculata* F.
5. *Chilomenes sexmaculata* F ab *inornata* Ws.
6. *Chilomenes sexmaculata* F ab *rufofasciata.*
7. *Chilomenes sexmaculata* F var. *undulata.*
8. *Brumus saturalis* F.
9. *Verania cardoni* Ws.
10. *Chilocorus nigritus* F.
11. *Chilocorus circumdatus* F.
12. *Sumnius renardi* Ws.
13. *Sumnius cardoni* Ws.
14. *Scymnus nubilus* Muls.
15. *Scymnus* sp.
16. *Rodolia fumida* Muls.
17. *Rodolia* sp.
18. *Thea cincta* F.
19. *Sticholotis* sp.
20. *Synia melanaria* ab *rougeti* Muls.

Out of the above 20 species collected at Kanpur, the species number 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 14 are very common and are found feeding year after year on aphids, citrus psylla, mango mealy bugs and mango scale. It has been observed that mustard, jowar or maize aphids, citrus psylla, mango mealy bugs and mango scale (*Pulvinaria* sp.) cause serious damage once in every five years or often even more. The population of these insect pests increases in the fields and the natural control is brought about by these beetles to a very great extent.

On the basis of these field observations, experiments were laid out under laboratory conditions to find out the degree of mortality caused by the grubs and adults of the predaceous coccinellid beetles. The following table gives percentage of host insects eaten by one grub and one adult and the maximum fecundity of seven species.

The percentages given are for one grub and one adult for comparison.

It will be observed from the above table that each of these beetles destroys a fairly high percentage of pests. *Sumnius renardi* Ws. destroys a large number of the early stages of mango mealy bugs. In 1946-47 the whole mango tree was covered with the grubs and adults of this beetle and had brought about considerable mor-

Percentage of mortality caused by some common Indian Coccinellidæ

Name of the predator	% Destroyed by			Fecundity		Days			Host
	Grub	Adult	Average	Max.	Average	Grub	Adult	Average	
Coccinella septempunctata L.	84	73·6	78·8	562	395	13	36	24·5	Aphis
Chilomenes sexmaculata F.	88·3	86·1	87·2	632	373	9	28	18·5	do
Brumus saturalis F.	91·8	79·9	85·85	114	105	12	23	17·5	do
Coccinella 11 *punctata* L.	95·7	87·0	91·35	450	322	14	33	23·5	do
Coccinella 11 *punctata* var. *menetriesii* Muls.	..	92·1	..	..	..	..	31	..	do
Verania cardoni Ws	..	89·7	..	350	181	..	28	..	do
Average ..	89·95	84·73	85·8	421·6	275·2	12	29·83	21	
Chilomenes sexmaculata F.	83·8	90·3	86·5	..	..	9	35	22	Psyll a
Brumus saturalis F.	..	91·9	..	..	..	..	25	..	White fly
Sumnius renardi Ws.	77·2	64·4	70·8	420	298	22	61	41·5	Mango mealy bug.

tality of the mango mealy bugs. *Chilocorus nigretus* F. was also observed to feed extensively on the mango scale (*Pulvinaria* sp.).

The mortality of aphids caused by the several species of coccinellid beetles, individually and collectively, is encouraging. The maximum fecundity and average fecundity of these beetles is satisfactory. The period during which mortality was caused by the grubs and adults is fairly long and they were active throughout the year. Thus above quantitative data indicates the potentiality of these predators in the control of these pests provided they are used under known biological conditions.

Mass rearing under controlled conditions and their liberation in the infested fields, on the lines of Los Angeles Laboratory, U.S.A. for *Cryptolæmus* and *Rodolia* may thus provide an ample opportunity to the applied Entomologists for using biological control on some of the hemipterous insect pests of crops in India by indigenous Coccinellidæ.

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Agricultural College,
Kanpur,
September 7, 1948.

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ON A NEW CERCARIA, DETERMINED TO BE THE LARVA OF *GASTRODISCUS SECUNDUS* LOOSS, *1907*

During the course of a systematic study on the cercarial fauna of fresh-water molluscs in Madras, a type of Amphistome cercaria was met with, which differed considerably from the known species of the group. Transmission experiments revealed that this is the larva of *Gastrodiscus secundus* Looss, 1907.

This cercaria was obtained exclusively from *Planorbis exustus* Deshayes. Its general behaviour and morphological features are very much in conformity with those of the other Amphistome cercariæ, excepting for the deviations mentioned below. It presents all the characters described for the subgroup "Diplocotylea" of Sewell (1922). Only two forms belonging to this subgroup—*Cercariæ Indicæ XXI* Sewell (1922) and *Cercaria kylasami* Rao (1932)—have been previously reported from India.

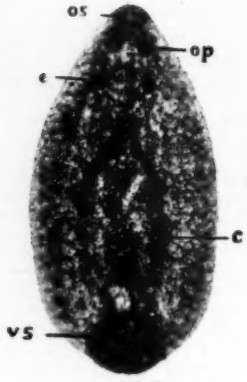
The present one can be differentiated from the two forms mentioned above by the following features :

1. The presence of two well-defined oral pouches (pl. 1),

2. The occurrence of yellowish-brown, rectangular, crystalline contents in the œsophagus and the cæca,

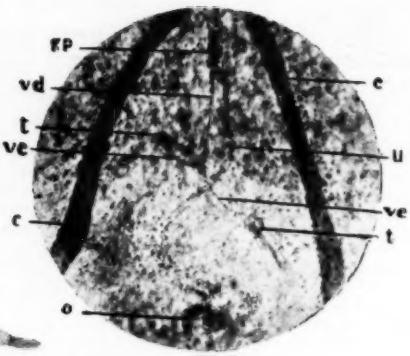
3. The less tortuous course of the main excretory trunks (pl. 2) which are provided with lateral evaginations, anteriorly,

4. The typical picture afforded by the different cell groups of the genital system (pl. 3) which are arranged exactly similar to the reproductive organs in the adults of the genus *Gastrodiscus*.



Pl 1.

Pl 2.



Pl 3.

5. The excretory granules in the retrograde continuation of the main excretory canals, and the floating intestinal glands with their ducts and atrium described for *Cercaria kylasami* are lacking in this cercaria under study.

These cercariæ develop in sausage-shaped rediæ, infesting the digestive gland of the molluscan host. The rediæ have almost the same morphological features as described for the other Amphistome redial stages. But it differs from those of the other Indian members of the "Diplocotylea" group in the presence of dark, irregular pigmentary patches on the body-wall in larger specimens only, the absence of ambulatory processes and gut contents, and in the existence of distinct excretory bladders. The rediæ are found to give rise to daughter rediæ or cercariæ or both.

The cercariæ and their parthenitæ raised experimentally in the laboratory, by infecting *Planorbis exustus* with miracidia from the eggs of *Gastrodiscus secundus*, are exactly identical in every detail to those discharged by the snails that had the natural infestation with this type.

Further, adult specimens of *Gastrodiscus secundus* were recovered from the experimental donkey-foal, fed with the newly obtained cercariæ—a fact, which establishes that the cercaria under study is the larva of *Gastrodiscus secundus*.

A detailed study of the different aspects of both the pre-cercarial and the post-cercarial stages in the development of *Gastrodiscus secundus* is in progress.

Summary.—A new cercaria has been described belonging to the Amphistome group and this has been established to be the larval form of *Gastrodiscus secundus*, by feeding experiments.

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Madras Veterinary College, S. V. Mudaliar.
September 1, 1948.

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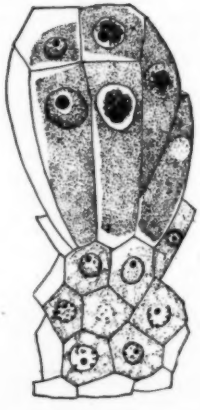
DEVELOPMENT OF EMBRYO-SAC IN SOME STERCULIACEAE

Our knowledge of the development of the embryo-sac in the Indian representatives of Sterculiaceæ is meagre (Y. M. L. Sharma, 1938 and I. Banerji, 1941). The present communication embodies some interesting features in the structure and development of the ovule and embryo-sac in five species of Sterculiaceæ, *viz.*, *Pterospermum Heyneanum* Wall, *P. acerifolium* Willd, *Klienhovia hospita* Linn., *Waltheria indica* L., and *Sterculia alata*.

Pterospermum species differ from other plants studied in having a multicellular archesporium. A group of 10-15 cells extending to two or three layers below the epidermis of the ovule function as archesporial cells; the hypodermal cells cut off primary parietal cells which give rise to a considerable parietal tissue while the sub-hypodermal cells function directly as the megaspore mother cells. Usually a few tetrads are formed in each ovule. A group of cells immediately below the archesporium in the central region of the ovule differ from the rest of the nucellus cells in being larger, having thinner walls, larger nuclei and vacuolated cytoplasm (Fig. 1). The lowest megaspores of the tetrads



(Fig. 1)

become much elongated and taper towards the cell complex mentioned, probably deriving nourishment from it. Ultimately these cells are crushed by the developing embryo-sac or sacs.

In the one-nucleate stage of the embryo-sac it is seen that the chalazal end elongates into a tubular haustorial process. The nucleus and most of the cytoplasm migrate into it. Usually the nucleus divides in this position (Fig. 2). An

(Fig. 2)

8-nucleate embryo-sac is formed after three successive free nuclear divisions. The antipodals degenrate early. Two or three embryo-sacs are formed in some ovules, a fact noted by Sharma also previously.

In the rest of the plants studied, the archesporium is 1-celled although occasionally two archesporial cells and even two 2-nucleate embryo-sacs in each ovule have been observed in *Klienhovia hospita*. Usually the chalazal most megaspore of the tetrad is functional in these plants but in a few cases of *Klienhovia* and *Waltheria*, the one above the chalazal most is seen to develop further.

In *Pterospermum* species and *Klienhovia hospita* the antipodal end of the embryo-sac remains tubular owing to the presence of a jacket of thick walled cells around it. A hypostase is formed in the basal part of the ovule in *Waltheria indica*.

A fuller account of the floral anatomy, microsporogenesis, and embryo-sac development will appear elsewhere.

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Andhra University,
Waltair.
September 12, 1948.

1. Sharma, Y. M. L., "A note on gametogenesis in a few members of Sterculiaceæ," *Curr. Sci.*, 1930, **7**, 284–85. 2. Banerji, I., "A note on the development of the female gametophyte in *Abroma augusta* L. and *Pentapetes phoenicia* L.," *Curr. Sci.*, 1941, **10**, 30.

SPHINCTERED APERTURES IN THE INTERSEGMENTAL SEPTA OF EARTHWORMS

In 1919 Bahl,[1] in the first of his remarkable series of papers describing the enteronephric type of nephridial system in earthworms of the family Megascolicidæ, also described *sphinctered apertures* on the intersegmental septa of the three species of *Pheretima*. These apertures have not been found in any other earthworm and in 1930 Stephenson[2] rightly remarked that, "So far as known, they are confined to genus *Pheretima*." Recently on examining two species of the genus *Drawida* (*D. ghatensis*, and *D. travancorensis*), sphinctered apertures have been found to occur in these earthworms as well, but that their situation is a little different. The septa of this worm are muscular and complete with no apertures on them at all, but there is a thin membrane, connecting the middle of the posterior face of each septum with the muscular bladder of the nephridium lying immediately behind it. It is this connecting membrane which is riddled with sphinctered apertures. I have counted the number of these apertures on *eight* such membranes and find that the average number is 200 on each membrane. The diameter of the apertures is, on an average, 57 μ, while the average thickness of the sphincter is 15 μ.

In discussing the possible function of these sphinctered apertures on the membranous septa of *Pheretima*, Bhal[1] wrote, "The sphincter muscles round the apertures are *a priori* the means of closing these apertures and thus restricting the flow of the cœlomic fluid to particular segmental chambers ..... which leads to a condition of turgidity of these segments and thus makes them stiff for the leverage of setæ." In case of *Drawida* apparently this explanation will not hold good, as the sphinctered apertures here do not lie on the main body of the septum, but only on a subsidiary membrane connecting the nephridium with the septum. There is little doubt that this subsidiary membrane supports and keeps the bladder of the nephridium in position. It is possible that the apertures minimise the chances of the membrane preventing a free flow of the cœlomic fluid within each segment.

I am thankful to Prof. K. N. Bahl for reading through this note and to Miss S. Mathew and Mr. P. V. Kurian for collecting the two species of *Drawida* from Travancore.

Vidya Vati.

University of Lucknow,
September 15, 1948.

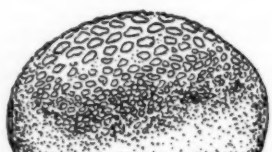
1. Bahl, K. N., *Quart. Journ Micr. Sci.*, 1919, **64**, Pt. I. 2. Stephenson, J. *The Oligochæta*, 1930, Oxford.

A TRUFFLE (*TUBER SP.*) FROM KODAIKANAL HILLS (MADRAS)

Truffles are highly prized in Europe as a delicate article of food, they are found in California also; fruit-bodies of trufles are dug up underground because they normally grow 3-12 inches below the surface of the soil; they emit a characteristic odour and are located by the aid

of specially trained dogs and pigs, whose keen scent enables them to spot these underground fruit-bodies right. The particular odour is not evident to most human beings. *Tuber* species occur commonly in deciduous forests of North Italy, France, Germany and other places in Europe. The mycelium of some species of Tuber has been recorded in France by late Prof. P. A. Dangeard in 1894[2] as a mycorrhizal symbiont with roots of various trees, especially oaks and beeches and some conifers; other species are true saprophytes. Truffles come under Ascomycetes—Tuberales—the genus being *Tuber*. The ascocarp remains closed after it is mature and the ascospores are liberated only after the decay of the outer covering. Spore-disposal is effected through the agency of animals, especially rodents. In California, some of the Tuberales are a favourite food of wood rats[4] which detect them by their very characteristic smell. The fruit-bodies (ascocarps) dug up by the rats may be eaten on the spot or carried to their dens; in either case, pieces falling on the ground, usually inoculate the soil. Ascospores may also be distributed as undigested spores passing through the alimentary canal of the animal that has swallowed an ascocarp.[3]

Ascospores



Ascocarp

Last month I received some specimens of truffles through the kindness of Dr. Mukherjee, Director of the Central Drugs Laboratory, Calcutta, collected from Kodaikanal hills (Madras) by Mr. C. G. Hylten Cavallius of the Western India Match Co. Ltd., in June and July 1948. The ascocarp is about 4 cm. long and oval-shaped with warty scales on the outer surface; ascospores are brownish, globose with diameter 10-12 μ spore-wall distinctly spiny, ascospores (2-4) enclosed within clavate thin walled asci. This *Tuber* sp. is a rare find for India. There is only one previous record of truffle from India, *Tuber indicum* Cke, and Massee in "Himalayan Truffle, 1892" listed in 'Fungi of India' by Butler and Bisby[1], it was collected by Duthie in Mussoorie hills.

Botanical Laboratory, S. R. Bose.
Carmichael Medical College,
Calcutta,
September 15, 1948.

1. Butler and Bisby, *Fungi of India*, 1931. 2. Dangeard, P. A., *Le Botaniste*, 1894, **4**, 61-87. 3. Massee, G., *Ann. Bot.*, 1909, **23**, 243-63. 4. Parks, H. E., *Micologia*, 1919, **11**, 10-21.

ACTIVE ELONGATION OF UNSTRIATED MUSCLE

Relaxation of striated muscle is known to be active; see Ramsey (1947) for references. Singh (1944), Singh and Singh (1946), Singh, Singh and Muthana (1947) have described active elongation of unstriated muscle. These experiments, however, were not satisfactory owing either to abnormal stimulus or abnormal saline used. Satisfactory evidence of active elongation during relaxation has now been obtained. Pieces of dog's stomach, if carefully dissected relax actively when stimulated with alternating current (12 volts for 10 seconds). The results are shown in Table I. The muscle was laid in a trough and stimulated isotonically. If the dissection is not good, then the pieces curl or twist and it is then difficult to follow relaxation.

Experiments No.	Resting length of muscle; mm.	Length during contraction mm.	Length after Relaxation mm.
1	55	24 (43, p.c.)	35 (63, p.c.)
2	65	40 (61, p.c.)	65 (100, p.c.)
3	60	32 (53, p.c.)	54 (90, p.c.)
4	39	35 (89, p.c.)	41 (105, p.c.)
5	55	31 (56, p.c.)	46 (83, p.c.)
6	66	42 (63, p.c.)	59 (89, p.c.)
7	65	34 (52, p.c.)	63 (97, p.c.)
8	65	43 (66, p.c.)	62 (95, p.c.)
9	52	30 (57, p.c.)	50 (96, p.c.)
10	30	20 (66, p.c.)	32 (106, p.c.)

It will be seen from the table that the relaxation is complete in many muscles. Active relaxation is antagonised by substances that produce tonic contraction, such as excess of lithium, ammonium, potassium, calcium, strontium, barium, bromide, nitrate, iodide, thiocyanate, cyanide, acetylcholine, iodoacetic acid. It is less evident if a strong stimulus is used (50 volts), or if the muscle is asphyxiated or after soaking in saline for about an hour, a procedure which increases tone.

Tonic contraction is then due to interference with active relaxation, in agreement with views recently published (Singh and Singh, 1948).

Physiological Laboratory, Inderjit Singh.
Medical College, Sunita Inderjit Singh.
Agra,
September 22, 1948.

1. Ramsey, R. W., *Ann. N. Y. Acad. Sci.*, 1947, **47**, 675. Singh, I., *Curr. Sci.*, 1944, **13**, 311. Singh, I., and Singh, J., *Proc. Ind. Acad. Sci.*, 1946, **23**, 312. 1948, **27**, 127. Singh, I. Singh, I., and Muthana, M. C., *Proc. Ind. Acad. Sci.*, 1947, **25**, 51.

REVIEWS

Astronomy. By William T. Skilling and Robert S. Richardson. (Revised edition. Chapman & Hall Ltd., London), 1947. Pp. xii + 692. Price 28 *sh.*

Astronomy has a special fascination for all educated people, whether trained in the natural sciences or in the humanities. A good book on astronomy can therefore be expected to interest a large circle of readers of one kind or another ; but it is not often that one comes across a book on astronomy which is of universal appeal. Skilling and Richardson's *Astronomy* is one of those rare books whose style and breadth of scope will satisfy almost everyone who is interested in knowledge for its own sake and who has stared up at the stars and felt a thrill of awe in the face of mystery and eternity. The first edition (1939) of the book filled the gap which existed between the entirely popular accounts of astronomy like some of the writings of Eddington and Jeans, which made the average man marvel at the astounding achivements of the human intellect in this branch of science, and the highly mathematical and sometimes abstruse books by the same great astronomers and many others, which are intelligible only to the professional astronomer or mathematical physicist. The revised edition (1947) of Skilling and Richardson's book is therefore sure of a welcome from layman and professional alike.

Although the book appears to be planned primarily as a text-book for American college students, its scope is vast,—that is the only adjective which suits. It is divided into three parts under broad headings. Part I is headed "The Earth and the Moon in Astronomy"; it deals not only with the earth and the moon, but also in a general way with the other members of the solar system and even with the essential principles of construction and use of telescopes, spectroscopes and various other instrumental equipment of the astronomer. A more detailed account of the sun and the planets (other than the earth) and their physical constitution comes under Part II which is headed "The Physical Nature of the Sun and Planets". Again the subject-matter of this part is much more comprehensive than the necessarily short title implies; for, in this part, the authors have wisely included a very simple, but quite effective, summary of the basic properties of light, of the ordinary and the radioactive atoms as well as an outline of the modern theories of the origin of spectra, without which the lay reader would be unable to appreciate the results of the study of the physics of the sun and the planets here described. To many readers,—at any rate to the present reviewer—, the highlight of the book would however be Part III, whose title is "The Stars and Nebulæ". Here we have a concise and yet very readable account of the fundamental facts so far discovered, as well as of some of the fascinating theories or speculations concerning the most distant components of the universe.

As I have already said, the scope of the book is vast. This vastness of range is at once the merit and the weakness of the book. The authors have made a praiseworthy attempt to include in a single, essentially descriptive volume practically all important known facts and theories of astronomy. This is humanly impossible to achieve, and the inevitable result has been a certain degree of sketchiness in the treatment of some matters, and some subjects have received inadequate attention notwithstanding their undoubted interest and importance. To mention a few, one would have liked to have a fuller description of the theories of cepheid variation, of the interior of stars, of interstellar matter, of the magnetic fields of stars, etc. Though the book is written in a semi-technical, descriptive style, the authors have achieved a remarkable measure of success in maintaining a high standard of accuracy in the statement of scientific facts. But a few loose statements, though of minor importance, have crept in; for instance, it is not strictly accurate to say that "They (i.e., monochromators developed by Ohman and others) do optically what the spectroheliograph does mechanically" (*vide* p. 167). Again, from the last sentence on p. 364 one gets the impression that prominences projected on the disk of the sun generally appear "as long, dark plume-like markings roughly parallel to the solar equator"; but the fact is that the dark markings definitely show a progressive increase of inclination to the meridians from the equator to the poles, the inclination to the meridians being, on the average, zero at the equator and 90° at the poles.

The book is very well illustrated and has a number of instructive tables and charts, as well as an Appendix which includes a glossary of technical terms used in the text and a list of astronomical and physical constants. It is, I believe, the most up-to-date and informative book on descriptive astronomy that is available at the present moment. The authors, one of whom is a retired college professor and the other an active researcher at the most modern and powerfully equipped observatory in the world, deserve all praise for their planning and writing of this excellent book in which answers in simple language to an amazing number of cosmic problems will be found.

A. K. Das.

Fundamental Principles of Ionospheric Transmission Radio Research Special Report No. 17 of the Department of Scientific and Industrial Research and Admiralty. Published by H. M. Stationery Office, London. Pp. 82, Price 1s 6d. net.

This booklet was issued during the War to the Services to interpret the results of observations of the conditions in the Ionosphere into instructions for procedure in operating the complex

radio services required. As such, it attempts to cater to the needs of a wide variety of readers. A natural consequence of this has been admitted in the foreward itself. It is too detailed and academic for wireless operators and low grade technicians and rather sketchy for the research physicist and engineer. This, however, does not diminish the value of the book. It is a most welcome publication to persons like the reviewer who have to recommend an authentic and accurate account of the Ionosphere and its effect on radio communication to telecommunication degree students and to a large number of technicians receiving an advanced training. To this class of persons, the book is a real boon. The book is also very useful to the large number of physicists who are not specialists in Radio-physics and to the honours students in physics who have examinations to consider.

The book is divided into seventeen sections which include the discussion of the ionosphere as a refracting medium, vertical and oblique incidence, transmission curve technique, reflection from multiple layers, determination of actual heights, effect of the earth's curvature, effect of the earth's magnetic field, characteristic polarisation of waves, absorption, formation of the ionosphere, diurnal and seasonal variations, echoes, scattering, effect of sunspot cycle etc. The treatment is everywhere simple and straightforward. The use of mathematics is reduced to a minimum. All the statements are accurate and clear. The diagrams are very neatly drawn and very illustrative.

The ray treatment is followed everywhere. This is very useful and makes explanations easy. There is, however, another view. The reviewer is strongly of opinion that it is desirable to follow the full wave treatment and where this is not possible, the results only should be stated. Over-emphasis of the ray treatment may lead to wrong conceptions in the mind of the inexperienced reader. This is the only, if it considered so, a defect of this otherwise excellent book.

On the whole, the book is a very brief but very clear and authentic monograph on Ionospheric Transmission and is certainly worth many times the price for which it is put on sale. It is indispensible to College libraries and can be strongly recommended as a text-book to a wide variety of readers.

S. V. CHANDRASHEKHAR AIYA.

Electron and Nuclear Counters. By Korff. D. Van Nostrand & Co., New York publication & Macmillan & Co., as agents 1948. Price $3·22 or 18*s.* net.

This book was first published in April 1946. reprinted in September 1946, April 1947 and January 1948 and has 212 pages. The author is Professor of Physics and Supervisor of Physical Research, College of Engineering, New York University. In this book is gathered together and summarized pertinent facts regarding the theory of the discharge mechanism and the practical operation of various types of counters. As well pointed out in the book, counters have been known for about 40 years, still their construction and operation are claimed by many competent physicists as almost involving "magic". Various laboratories have indeed developed special procedures for their construction and use, often not fully understanding why particular technique appear to be most successful.

In the book we have first a discussion of the internal mechanism of the discharges in the counter and then of the constructional and operational features which are desirable and the means adopted to secure them. Subjects discussed include the usual and commonly used counters as well as those for special purposes and those selectively sensitive to particular types of particles, such as those which preferentially count neutrons in the presence of a strong background of gamma radiation.

The first chapter serves to introduce the subject and to describe the progressive changes in the behaviour of he counter as the voltage is gradually raised. The terminology to be used in describing the counters is next defined. Then the operation of the instrument, first as an ionization chamber, then as a proportional counter, and finally as a Geiger counter, is developed and the theory and operation of each different type of counter is set forth. The practical aspects are next considered and the construction of counters is taken up. The reasons for the various constructional features are given. The errors and corrections encountered in using these devices are discussed. Finally, the various electronic circuits, which are the essential auxiliaries to the successful operation of various kinds of counters, are presented.

The counter is a basic instrument in the modern day atomic research just like the galvanometer has been ever since the early days of electrical science for current electricity. Prof. Korff's is the first book of its kind in the English language and no student of research or even a teacher expounding the field of recent atomic research can well remain without possessing a copy of this book.

B. DASANNACHARYA.

Mechanical Behaviour of High Polymers. *High Polymers*—Vol. VI. By Turner Alfrey, Jr. (Interscience Publishers, Inc., New York), 1948. Pp. vii + 581. Price $ 9·50.

This moderately priced and elegantly got up book forms Vol. VI of the famous High Polymers monographs on the Chemistry, Physics and Technology of High Polymers edited by Prof. H. Mark and his colleagues. In this volume Turner Alfrey. Jr. has dealt with the fundamental princ'ples underlying the visco-elastic behaviour of high polymers in relation to the molecular structure, amorphous, crystalline, linear or cross-linked. As only a few of the important high polymers are studied so far from this point of view by Rivilin and Kirkwood, the mechanical behaviour of high polymers such as elasticity, viscous and plastic flow, is discussed on semi-empirical grounds based on the research in the author's laboratory.

This book sets forth a model for further study of similar fundamental studies on the myriads of high polymers not only on the visco-plasto-elastic property which governs the practical application of these polymers but also on the concomitant changes in

molecular structure as revealed by electrical and optical properties such as dielectric constant, double refraction and light scattering by infra-red and X-rays and by other physico-chemical methods such as swelling, adsorption, etc.

The next volume of the High Polymer series deals with phenoplasts, their structure, properties and technology. These books form a valuable contribution to our knowledge of the Physics and Chemistry of Plastics.

S. K. K. JATKAR.

The Science of Plastics Edited by H. Mark and E. S. Proskaur. Vol. I (Interscience Publishers, Inc. New York). 1948. 632 pages. $9·00.

The publishers have contributed this volume I on the progress of the Science of Plastics during the years 1942-1947 reprinted from the original Abstract Service 'Resins, Rubbers and Plastics' issued in loose leaf form, with a comprehensive Index. The book deals with general properties, physical chemistry, reaction kinetics and technology and with general aspects of different types of Plastics.

These abstracts unlike the usual ones give all the important information such as the skecth of apparatus used, procedure, experimental data (or figures), etc., required by the research workers and technologists, and make it unneccessary to refer to the original papers published in journals, most of which especially the continental ones are not easily available. The value of such moderately priced books to students of Plastics can hardly be overestimated. The progress of research on the Chemistry and Physics of Plastics is so rapid and the practical applications so many, that very few scientists could afford to neglect the up-to-date position of the science of plastics.

Such comprehensive *source* books are far cheaper than the usual text-books. The method of printing has in no way taken away the clarity of presentation or the get-up of the book.

We look forward to the publication of abstracts of papers on Vol. II which will deal with single plastics.

S. K. K. JATKAR.

Chemical Composition of Plants as an Index of Their Nutritional Status. By D. W. Goodall & F. G. Gregary. (Imperial Bureau of Horticulture & Plantation Crops, Great Britain), 1947. Pp. 167. Price 9d.

This technical communication from the Bureau of Horticulture and Plantation Crops is a very welcome addition to the literature on the subject of plant nutrition and the detection and measurement of nutritional deficiency of field crops. It is devoted mainly to an exposition of the practical application of methods based on chemical analysis of plants for the determination of fertiliser needs of plants.

The book opens with a brief but concise account of the various methods of diagnosis now in vogue, *i.e.*, pot culture studies, field trails, soil analysis, analysis of plants and the observation of symptoms associated with the deficiency of particular nutrients. Then follows a historical account of the progress of methods based on chemical anaylsis of plants, the various theories advanced from time to time on the relationship between the composition of the soil, the plant and the added nutrient and of the present position of the technique in practical agriculture. The rest of the book is devoted to a comprehensive account of the method of diagnostic plant analysis. The treatment is very thorough, and details as to the technique and method and manner of sampling, analysis and interpretation of results, the limitations of the method in practical advisory work are all treated in full. The results of previous workers are discussed in their proper sequence and illustrated with paintakingly collected statement of the results. The advantages of the plant analysis method over other methods is briefly discussed, and the reliability of the results and great rapidity with which they can be obtained are stressed.

The problem of crop yields in relation to fertilizer supply is now engaging the urgent and earnest attention of scientists and others all over India. In the present context of inadequate food supply and undernourishment, the problem is one of added importance. The workers in the various agricultural departments all over India will find this book of immense value. The Indian workers have so far relied on the traditional, timeconsuming methods of soil analysis and field trial to guide them in their efforts to study the fertiliser requirements. Diagnostic plant analysis has not yet received their practical attention. It is a new field with immense possibilities for India where rapid and reliable diagnosis of soil and crop requirements is now an urgent necessity.

The authors have compiled an exhausting bibliography, which alone would make it worthwhile to own a copy of the book.

B. D.

Using Salty Land. An F.A.O. study prepared by H. Greene, Soils Specialist, Land Use Branch, Agriculture Division of the United Nations. (Published: Washington, U.S.A.), February 1948. Price 50 cents.

This is the third number of the F. A. O. Agricultural series and is an excellent small monograph running over 49 pages. Written by one who is a specialist in the field, it is easily understood by the layman and of great interest to the technician. It is of great topical interest as the food production of the world consequent to the World War II is very much below that required by the population. With the establishment of peace and the increase in population that must be expected hereafter, every acre of land that can produce food must be utilized and brought under cultivation. This little book tells of the past trials and successes of bringing salty land under cultivation—land that had once been considered unfit for growing crops.

After dealing with the processes that cause the formation of salty soils, it recounts briefly the reclamation experiments conducted in Egypt, Sudan, North China, Sanjoaquin valley, California, U.S.A., in Northern India, in the Poltava region and the lower Volga region of the U.S.S.R and in Hungary. A brief review

of the work of the Russian Soil Scientists is made based on the account of D. G. Vilensky and the formation of Solonchak, Solonetz, and Solodi described.

Further chapters are devoted to base exchange complex of Solonetz and Solodi, Marine reclamation and a very sufficient account of the problems of reclamation, of removing excessive salts, removal of exchangeable sodium magnesium and hydrogen follows. Irrigation problems, the salt content of irrigation water and the relationship between the salt content of the irrigation water and the salt content of soil and alkalinity of the soil to be reclaimed through irrigation is presented in a very attractive manner.

The last chapter deals with organization that has to handle the problems of reclamation. "There are broadly two ways of undertaking a large-scale project. The administrative authority may take over the whole task providing both the money needed for development and the technicians to carry out all stages of the work. This method is used in the U.S.S.R. and was notably successful in the Tennessee Valley, U.S.A.

On the other hand it is possible in some cases to balance the main items of capital expenditure against increased production from the reclaimed land. It may be convenient for the administrative authority to entrust the main work of reclamation to a commercial corporation, which would buy salty land at low price, reclaim it and sell it at high price. The directors of the commercial corporation can make the general and local surveys in sufficient detail to protect their own interests and the administrative authority can ensure that the profit gained is not unreasonable. The administrative authority will incur additional expenses of a recurrent kind and will be recouped by the increased value of land adjoining that actually reclaimed and by increased revenue from a number of sources..... "It is usually to the advantage of both parties for reclamation to be carried out on a small scale for a few years before the major agreement is made. This system is appropriate to our economic system in which individuals put money and labour into a project in the hope of gaining profit; it also has the advantage that the administration incurs less expense and is less burdened by supervision of details".

Mr. Greene concludes, "In any case success depends on a first evaluation of the physical conditions and on the effective and continued co-operation of people having varied skills."

N. G. C.

Veterinary Education. By Prof. Beveridge. (Cambridge University Press), 1948. Pp. 40. Price 1 *sh.*

It is a matter of great pleasure to read the booklet since it is not only rich in facts and figures, but unique in its presentation and information in its details. The author has taken great pains to collect information regarding the progress of Veterinary Education from as early as 4000 B.C. Unfortunately he has restricted himself to Western World only, probably because he could not get enough material to trace the development of this science in the East. He has very ably shown how humanity has transferred some of its disgust towards animals to Veterinarians for no fault of theirs. The author deserves congratulations for a pioneer attempt to remove false impressions and ridiculous associations of the word "Veterinary" in the minds of the public. His remarks regarding the details of Veterinary Curriculum are naturally based on his own experience and though the basic principles cannot be ignored, the details as given by him will have to be modified to suit a particular country. His call for a closer collaboration between Medical and Veterinary professionals in the field of research deserves greatest appreciation. The spirit of co-operation between research workers in such diverse fields as Agriculture, Veterinary and Medical or any of the pure sciences towards a common goal, namely the progress of humanity as a whole, is certainly the greatest need of the day, and the author has correctly hinted at that in his writing.

The booklet is written almost in the form of a brief extract and therefore certain important points are only touched and not dealt with in detail, for instance the subject of animal psychology and its place in present-day Veterinary Education. The author has enunciated a very sound dictum that the aim of Veterinary Education should be to produce graduates whose minds are malleable and who will continue throughout the rest of their lives to absorb and use new knowledge. The book makes its appearance at a very critical period in human civilisation when the acute struggle is going on between mechanisation under the name of industrial progress and spiritual enhancement of human society. If the world were to think of animals only as a means of transport or articles of food, then surely the soul of man has degraded itself, since it cannot appreciate the soul of animal and values only the body of the animal. Prof. Beveridge has rightly said, "In this age of Mechanization we are perhaps apt to forget the tremendous part played by domestic animals in our History."

The Professor has also given a correct conception of Veterinary Science when he says, "It is largely to these lossess by Animal Plague that modern Veterinary Colleges owe their origin."

The book is really entertaining in some of the quotations given by the autnor from old law books and scriptures.

Any one interested in Veterinary Education can refer to this book with pleasure and those who are indifferent will certainly change their feelings about Veterinary world if they go through this book.

S. R. CHADHA.

Botanik der Gegenwart und Vorzeit von Karl F. W. Jessen (Republished by The Chronica Botanica Co., Waltham, Mass., U.S.A.), 1948. Pp. 528. Price $6·00.

The book under review forms the first volume of offset reprints of out-of-print classic scientific works under the new series *Pallas*. The task

of rendering into scientific precision any historical account of a branch of science, especially biology, is not a light one. In this extremely difficult line Jessen has maintained the German tradition of the nineteenth century when books of a similar type were published by contemporary botanists like Sachs, Meyer and others. Admittedly this little book has a fund of information on all aspects of botanical work in the nineteenth century. To those of us who are almost stupefied by the increasing output of diverse types of researches with a strong bias towards the application of Physical Sciences in the new approaches of botanical investigation, it is refreshing to read about the very conservative and pure line approach of problems of botanical interest during the last century. Quite rightly, Dr. Verdoorn points out that "today it is almost impossible to write a short history of botany in one single volume of limited size as Jessen was able to do." One has to appreciate the cultural aspects of the work and the humanistic approach to a historical account and this has been admirably fulfilled by Jessen. To all lovers of this history of botany the reviewer warmly reommends the book, written in simpple yet elegant German, and most probably is a unique production which will be appreciated for its fund of information of nineteenth century botanical progress. Dr. Frans Verdoorn is to be congratulated for bringing this new series which makes available older classical literature which are so rare and difficult to obtain.

T. S. SADASIVAN.

Diseases of Cotton in India, By B. N. Uppal, (Indian Central Cotton Committee), 1948. Price Rs. 2.

The present status of our knowledge regarding diseases of cotton, which is an important crop in India extending over 20 million acres, is summarised in this publication. Seventeen diseases of cotton are described most of them being of minor importance in general, though occasionally they assume an epidemic form, except cotton wilt and cotton root rot, which are serious diseases caused by soil bourne organisms. Of some importance in certain areas are dry rot, anthracnose and red blight, the last one attacking only American cottons. A comprehensive summary of work done in India on these diseases over a period of 25 years is presented by the author paying special attention to etiology, control measures, etc., which will be of value to research workers in this field. Two of the diseases cotton wilt and cotton red rot are described in greater detail than the rest of them. The value to the research worker would have been greatly enhanced if an attempt had been made to correlate the details of the work done in India with work done in other countries on the same or similar diseases. For instance the real cause of wilt (*Fusarium vasinfectum* Atk.) in cotton, once considered to be due to the accumulation in the cells of aluminium salts, is now stated to be due to a chemical compound which remains active after boiling and after passage through a porcelain filter. It is said that the filtrate is not destroyed by heating in an autoclave at 110-115° C., and that the nature of the substance is not fully known. It is twenty years ago that the above mentioned results had been obtained by workers in India. Now, it will provide useful information to a research worker on this disease, if mention has been made about the work done by Gaümann an Jaag (Experientia Vol. II, 1946) on the problem of wilt diseases in plants. They found that a plasma poison named *Lykormarasmin* produced by Fusarium lycopersici caused patnological wilting of tomato plants at a dilution of 10^{-2} mol and 10^{-3} mol. A similar substance of the Marasmin group ($C_{11}H_{17}O_7N_3$ is possibly the cause of wilt in cotton. While no doubt a lot of information has been collected by the author from pulbished and yet unplublished articles, and from information elicited through letters, all of which are presented in this useful pulbication, correlation of results obtained by workers in India, with those obtained in other countries on cotton diseases will be helpful to future workers. However, we have, in this publication an excellent and comprehensive summary of work done in India on cotton diseases, which will be of great use to workers in this line, both in the laboratory and in the field.

M. J. N.

ANGLO-U.S. EDUCATIONAL AGREEMENT

AN important agreement has been concluded by Britain and the U. S. which will benefit students in both the countries. The agreement was signed by Mr. Bevin, Britain's Foreign Secretary, and the United States representative in London. A Joint Commission of 12 is to be set up in London, the American members being appointed by the American Ambassador and the British members by the Foreign Secretary.

It will recommend how the $50,000,000 realised from the sale of United States surplus property in Britain shall be spent on educational facilities for the benefit of students undertaking advanced studies in both the countries. This use of the fund from the sale of surplus property is authorised by a United States legislation known as the Fulbright Act. Senator Fulbright was himself present when the agreement was signed.

It is a great post-war experiment based on the feeling that the solution for international problems can be found if people in all countries can be brought to know each other as free men. It is obvious that increased understanding between the United States and Britain resulting from this interchange of students, teachers, professors, and research workers will be of the highest importance.

This fund will be devoted mainly to finance the studies of American students in Britain and the Commonwealth as also of British and Commonwealth students in the United States. Educational programmes will be planned and the teachers, professors and research workers selected to participate in them will be chosen by the Commission.

SCIENCE NOTES AND NEWS

Reorganisation of Medical Libraries in India

Dr. D. V. Subba Reddy, Officer on special duty, Madras Medical College, writes :—

There are a number of valuable old medical books, printed in various countries of Europe in the 18th and 19th centuries, lying unknown and unutilised in India and gradually disappearing or disintegrating.

The Government of India have recently approved of a scheme to search for salvage and examine the old medical books in various libraries in India with a view to prepare a special catalogue of these valuable books. Circulars have been sent to all the Medical Colleges and other Medical Institutions in India, requesting lists of such old books for detailed examination. Some of the books will have to be photographed to show the title pages or illutrations. An analysis of the contents and the importance of the books as well as biographical notes of the author will have to be added.

Special attention has to be given to old medical books, dealing with the health problems and diseases of India and neghbouring countries, and also to those books written by various medical men serving in India, either as East India Company's doctors or as surgeons attached to Native States or private Missions.

Some of these books have been printed in India and may not be available easily in Western countries and libraries. Their existence or contents are unknown to European and American teachers and writers on Medicine. Even in India all the books printed in India on diseases of India in the 18th and 19th centuries, are generally unknown to the Indian medical profession. When somebody knows about the existence of an old medical book, it is not available in certain parts of India. There is no list of such old books and whether they are available in India and if so where.

May I request your readers to pass on any information they have, regarding the existence of old medical books, particularly those printed in India or manuscripts, in any private collection or in the private libraries of the medical practitioners of the last century. Many of the private libraries of the Native States zamindars, educated and cultured families, missionary establishments, various printing presses and publishing houses, may have a few valuable old medical books, which may not be available in the public or medical college libraries. All lists of such books or the addresses of persons where such books are available or even the books themselves may be sent to me.

Dr. J. N. Mukherjee

Dr. J. N. Mukherjee, Director, Indian Agricultural Research Institute, New Delhi, has been invited by the Organising Committee of the Fourth International Congress of Soil Science (Amsterdam) 1950 to become one of the Vice-Presidents of the Congress.

The Economic and Social Council of the United Nations has called a United Nations Scientific Conference on the Conservation and Utilisation of Resources to be held in the United States in May or June 1949. Dr. Mukherjee has been invited to prepare a paper on Tropical Climates for presentation before the sectional meeting on "Improving soil productivity".

Cellulose-bearing Matetials other than Cotton for Rayon Manufacture

Investigations conducted at the Technological Laboratories of the Indian Central Cotton Committee show that certain species of bamboo, reeds, bagasse, jute fibres, etc., can yield pulps suitable for rayon industry by employing modifications in the normal treatment. The pulps obtained after processing these raw materials under optimum conditions of kier boiling and bleaching have been evaluated and it is found that they compare favourably with the imported pulps for rayon manufacture.

Oil from Kamala Seed

The chemical examination of the seeds of the Kamala plant *Mallotus philippinensis* (which is noted for its dye importing a beautiful, deep bright, durable orange colour to silk), made at the Chemical Laboratories of the Council of Scientific and Industrial Research, Delhi, shows that the oil is yellowish brown in colour and polymerises to a rubbery mass in about a fortnight. With lead linoleate as an additive, the oil gives rapidly drying film as in the case of tung oil.

Wood Corrosion and Hot Chemicals

The effect of hot chemicals on Cypress both in the natural state and after various protective treatments, is described in the Indian Forest Leaflet No. 101, which has just been published. The treatments studied showed varying degrees of protection, phenol formaldehyde generally being the best. Cypress was found to be resistant to hot sulphuric acid upto 10% even when unprotected.

Dr. Frans Verdoorn

Dr. Frans Verdoorn, Managing Editor of *Chronica Botanica*, has been elected a Corresponding Member of the International Academy for the History of Science in Paris and Chairman of the newly established International Phytohistorical Committee of the International Union of Biological Sciences.

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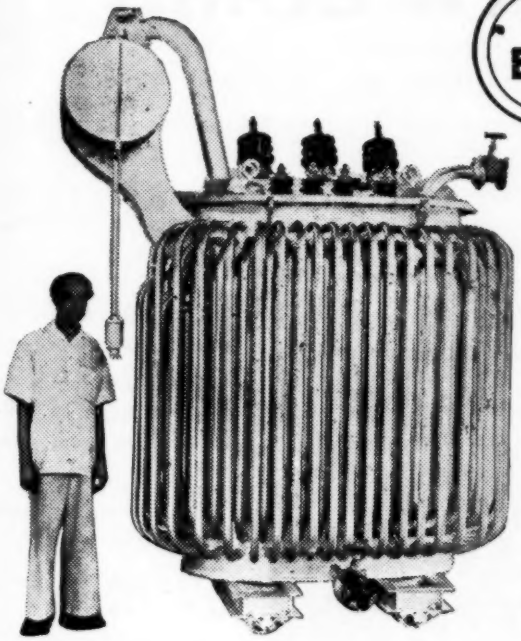

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